Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC

In the Matter of	)	
	)	
Restoring Internet Freedom	)	WC Docket No. 17-108
	)	

COMMENTS OF THE FIBER BROADBAND ASSOCIATION ON THE NOTICE OF PROPOSED RULEMAKING

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The Fiber Broadband Association ("FBA" or "Association")[1] hereby submits these comments in response to the Federal Communications Commission's ("Commission's") Notice of Proposed Rulemaking, in the above-captioned proceeding,[2] which proposes to end the Commission's "utility-style" regulatory approach for broadband Internet access service it adopted in the *2015 Open Internet Order*[3] and restore market-based policies.

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1 FBA was formerly known as the Fiber to the Home Council Americas (the "FTTH Council"). The Association's mission is to accelerate deployment of all-fiber access networks by demonstrating how fiber-enabled applications and solutions create value for service providers and their customers, promote economic development, and enhance quality of life. The Association's members represent all areas of the broadband access industry, including telecommunications, computing, networking, system integration, engineering, and content-provider companies, as well as traditional service providers, utilities, and municipalities. As of today, FBA has more than 250 entities as members. A complete list of FBA members can be found on the organization's website: https://www.fiberbroadband.org/.

2 *See Restoring Internet Freedom*, WC Docket No. 17-108, Notice of Proposed Rulemaking, FCC 17-60 (rel. May 23, 2017) ("NPRM").

3 See *Protecting and Promoting the Open Internet*, WC Docket No. 14-28, Report and Order on Remand, Declaratory Ruling, and Order, 30 FCC Rcd 5601 (2015) ("2015 Open Internet Order").

I. INTRODUCTION AND SUMMARY

In the *NPRM*, the Commission proposes to return to classifying broadband Internet access service as an information, and not a telecommunications, service and eliminate the Internet Conduct Standard. The Commission also inquires whether to adopt the Bright Line Rules and the Transparency Rule.[4] Finally, the Commission proposes to conduct a cost-benefit analysis of the rules and policies adopted as part of the *2015 Open Internet Order*.[5]

In these comments, FBA urges the Commission to also restore "economic rationality" to its consideration of whether and how it should intervene in and oversee the provision of broadband Internet access service. In numerous filings prior to the Commission's adoption of the *2015 Open Internet Order*, broadband Internet access service providers ("ISPs") demonstrated that they were in no position to extract monopoly rents.[6] Yet, despite this evidence, the Commission in the *2015 Open Internet Order* found that an ISP is a gatekeeper (i.e. has a terminating monopoly) and that, because of that control along with policy considerations, regulation is warranted.[7] FBA continues to contend the Commission erred in this finding, and it discusses that issue again herein. FBA also examines retail pricing for broadband Internet access service and supply data, both of which indicate that ISPs did not have

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4 *See NPRM*, paras. 24, 72, 76.

5 *See NPRM*, paras. 105-115.

6 *See, e.g.*, Reply Comments of AT&T Services, Inc., GN Docket Nos. 14-28 and 10-127, at 99-102 (Sept. 15, 2014) ("As AT&T has explained, the terminating access monopoly is a creature unique to the legacy telephone network, where network inefficiencies and regulatory distortions *do* give some carriers power to demand exorbitant fees for terminating other carriers' traffic. But Internet traffic exchanges suffer from neither of these infirmities…the web of relationships among IP networks and the robust market for transmission alternatives ensures that there are many efficient paths through which Internet traffic can reach an ISP's customers.").

7 *See 2015 Open Internet Order*, paras. 79-84.

market power when the Commission adopted its rules or that ISPs do not have market power today. Thus, the economic premise for the Commission's *2015 Open Internet Order* is undercut.

II. ISPS ARE NOT GATEKEEPERS[8]

In both the *2010 Open Internet Order*[9] and *2015 Open Internet Order*, the Commission found that ISPs, regardless of size and presence of competition, had "terminating monopolies," that is they were "gatekeepers" controlling access to customers for edge providers and thus needed to be regulated.[10] The D.C. Circuit Court in *Verizon v. FCC* found the Commission supported this finding,[11] but in his opinion, Judge Silberman remarked that the concept of a "gatekeeper" appeared to be "largely invented" and the Commission provided no explanation of its "economic significance."[12] But, even assuming *arguendo*, there is some economic validity to

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8 While FBA believes there is value in discussing the flaws with the "gatekeeper" rational as part of this proceeding, it acknowledges, as discussed above (*see* n. 6 *supra*), that many ISPs discussed the inapplicability of the terminating monopoly concept during the previous Open Internet proceedings. *See, e.g.*, *Ex Parte* Letter from Jonathan Banks, Senior Vice President, Law & Policy, USTelecom, to Ms. Marlene Dortch, Secretary, Federal Communications Commission, GN Docket Nos. 14-28 and 10-127 (Feb. 18, 2015). FBA also incorporates into its filing and its discussion the law review article on this issue by Jonathan E. Nuechterlein and Christopher S. Yoo, which elaborates at length on this inaptness of the terminating monopoly concept to ISPs. *See* Jonathan E. Nuechterlein and Christopher S. Yoo, "A Market-Oriented Analysis of the 'Terminating Access' Concept," 14 Colo. Tech. L.J., 21, (Nov. 2015) ("Nuechterlein/Yoo Article").

9 *Preserving the Open Internet, Broadband Industry Practices*, GN Docket No. 09-191, WC Docket No. 07-52, Report and Order, 25 FCC Rcd. 17,905 (2010) ("2010 Open Internet Order").

10 *See, e.g.*, *2015 Open Internet Order*, para. 80. The *2015 Open Internet Order* finds that ISPs, which provide terminating functionality, have monopoly power over interconnecting providers because their customers of the ISP are single-homed. The *2015 Open Internet Order* also seems to rely on other policy considerations to justify subjecting ISPs to regulation, but it did not conduct a market power analysis nor rely on the traditional concern about market failure.

11 *Verizon v. FCC*, 740 F.3d 623, 646 (2014).

12 *Id.* at 663 (Silberman, J., concurring in part, dissenting in part).

the 'gatekeeper" concept, it would apply in only very limited situations, as explained in the Nuechterlein/Yoo Article:

> A small consumer-facing network provider could exploit its terminating access monopoly to produce inefficient outcomes…whenever (1) a retail provider controls exclusive access to a potential recipient of a communication and could feasibly condition that access on the receipt of a termination payment, (2) a mechanism exists for the originator of the communication to make that payment either directly or indirectly, and (3) the originator has a strong need to reach the particular recipient in question and thus would be willing to pay supracompetitive rates to do so.[13]

As explained further below, all of these conditions are not present in the relationship between ISPs and interconnecting providers, and thus ISPs do not have the incentive and ability to engage in anti-competitive practices or other acts that harm access to the Internet.

The concept of a "terminating monopoly" stems largely from select Commission decisions regarding the interconnection and exchange of voice traffic.[14] In these instances, since the calling party wants, and will pay, to reach a particular end point (e.g. individual or location) and interexchange carriers are barred by the Commission from not terminating calls — in essence to meet universal connectivity objectives — local exchange carriers terminating those calls can extract supracompetitive rents.[15] The leverage of competitive terminating local carriers was enhanced even further, at least for a time, because the Commission did not review their tariffed charges.[16] As a result, the Commission has intervened to ensure rates from all terminating voice providers are just and reasonable, including by benchmarking competitors' rates to incumbent rates.

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13 *See* Nuechterlein/Yoo Article at 35.

14 *See, e.g.*, *Developing a Unified Intercarrier Compensation Regime*, CC Docket No. 01-92, Further Notice of Proposed Rulemaking, 20 FCC Rcd. 4685, para. 24 (2005).

15 *Id*.

16 *See e.g., Developing a Unified Intercarrier Compensation Regime*, CC Docket No. 01-92, Notice of Proposed Rulemaking, 16 FCC Rcd. 9610, para. 13 (2001).

As can be seen from this example, a "terminating monopoly" can only exist where an end user needs to reach a particular end-point (and not end-points in general) and an upstream entity cannot negotiate with, including by withholding service from, a provider connecting it with an end user. A real world instance can illuminate this critical distinction. Multichannel video programming distributors ("MVPDs") also are platform providers offering connectivity between upstream content providers and downstream end users.[17] However, MVPDs must negotiate for access to this programming — and video programmers have no requirement to provide their content either to the MVPD or any customer. As a result and because of demand for "marquee" programming, programmers have leverage over MVPDs. This is evidenced by the fact that content fees have been rising, and continue to rise, many times faster than retail rates (and much faster than inflation).[18] There are already projections that broadcaster retransmission fees are about to soar, further demonstrating that programmers have leverage and are not reluctant to use it.[19] As a result of this market phenomenon, it is well-recognized that mid-sized and smaller

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17 *See* Nuechterlein/Yoo Article at 28-32. In addition to this article, the Commission has received many filings over the past decade about the leverage upstream content providers have over MVPDs. *See, e.g.*, Letter from Michael Nilsson, Counsel for American Cable Association, to Marlene H. Dortch, Secretary, Federal Communications Commission, MB Docket No. 16-41 (Aug. 26, 2016).

18 *See Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming*, MB Docket No. 16-247, Eighteenth Report, DA 17-71, para. 72 (rel. Jan. 17, 2017) ("SNL Kagan maintains that video revenue increases have failed to keep up with increased costs and the result has been failing video margins (i.e., revenue minus cost divided by revenue.) At the end of 2015, video margins were just over 10 percent, down from 15 percent in 2014, and 20 percent in 2013."). For smaller MVPDs, who pay approximately 30 percent more than larger MVPDs for video programming content, margins are much less and have even turned negative. *See, e.g.*, "ACA: Rising Video Programming Costs A Drag on Broadband Deployment," American Cable Association (Mar. 9, 2015), available at http://www.americancable.org/node/5229.

19 *See, e.g.*, David Lieberman, "Retransmission Consent Fees Will Leap by 51% to $11.6B By 2022: Forecast," *Deadline* (June 29, 2016), available at

MVPDs have rapidly shrinking margins for their multichannel video product and many have been exiting — or would like to exit— this business.[20]

There is no material difference between the leverage held by video programmers in dealing with MVPDs and edge providers dealing with lSPs. In fact, in many instances, these programmers and edge providers are one and the same and stand in the same position regardless of whether the local provider is an MVPD or ISP. This may be best demonstrated by the actions of a video programmer engaged in a dispute with a local provider: it not only cuts off access by the MVPD to its traditional video content, but it commonly cuts off access to its online content from that same MVPD's ISP customers.[21]

The issue can be examined further by inquiring whether any ISP can be successful if it does not provide its customers' access to the "Frightful Five"[22] and other major upstream online content and service providers, which dominate in the provision of these services. Of course, it cannot. And, again as demonstrated from the MVPD world, even smaller content providers have

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http://deadline.com/2016/06/retransmission-consent-payments-increase-forecast-snl-kagan-1201781097/.

20 *See* n. 18 *supra.*

21 *See, e.g.*, Doug Halonen "Wheeler 'Concerned' Over Online Blackouts," *TVNewsCheck* (May 20, 2014), available at http://www.tvnewscheck.com/article/76465/wheeler-concerned-over-online-blackouts.

22 *See* Farhad Manjoo, "Frightful But Not Invincible," *The New York Times*, Business Day, B1, B7 (Jan. 5, 2017) ("Together the Five compose a new superclass of American corporate might…Their wealth stems from their control of the inescapable digital infrastructure on which the rest of the economy depends – mobile phones, social networks, the web, the cloud, retail and logistics, and the data and computing power required for future breakthroughs."). *See also*, Jim Rutenberg, "News Sites Take on Two Digital Giants," *The New York Times*, Business Day, B1 (July 10, 2017) ("This week, a group of news organizations will begin an effort to win the right to negotiate collectively with the big online platforms and will ask for a limited antitrust exemption from Congress in order to do so.").

leverage, even if they are mere start-ups. Netflix, once a marginal online provider, has flourished — and will not be disconnected by ISPs — because it acquires and produces content end users desire.[23] Moreover, content distribution networks, like Akamai and Limelight, help smaller entities gain leverage by effectively aggregating their content.[24]

All of this puts the lie to ISPs having "terminating monopolies." By making this error, the Commission has violated an essential first principle of regulation: by all means, do no harm in the market, especially one as dynamic and complex as broadband Internet access.

III. ISPs ARE REDUCING RETAIL RATES FOR BROADBAND INTERNET ACCESS SERVICE WHILE EXPANDING SUPPLY

As explained above, ISPs are not "gatekeepers" who can exercise undue leverage over edge providers. In addition, there is the broader question of whether ISPs have market power, which also would potentially provide them with the incentive and ability to harm edge providers and end users. The Commission did not conduct a market power analysis in reaching conclusions in the *2010 Open Internet Order* or *2015 Open Internet Order*. Two indicators of market power are whether prices are increasing and supply or quality is decreasing.[25] To analyze

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23 Ben Munson, "Netflix is in half of all U.S. broadband households, study says," *FierceCable* (July 11, 2017) available at http://www.fiercecable.com/online-video/netflix-half-all-u-s-broadband-households-study-says ("The figures surrounding Netflix were part of a wider Parks Associates study, which showed that 50% of U.S. broadband households now watch internet video on a television screen.").

24 It also should be noted not only that, as AT&T explained (*see* n. 6 *supra*), there are multiple paths an interconnecting provider can take to reach an ISP, but that in general smaller ISPs need to purchase transit to the Internet from another provider and thus cannot leverage an interconnecting provider.

25 *See, e.g.*, "Benefits of Competition and Indicators of Market Power," Council of Economic Advisers Issue Brief (Apr. 2016) available at https://obamawhitehouse.archives.gov/sites/default/files/page/files/20160414_cea_competition_issue_brief.pdf ("A firm with market power recognizes that if it reduces price to gain more customers, it loses revenue of the existing customers it already has. Thus, it

whether these indicia are in fact present for the provision of broadband Internet access service, FBA undertook an analysis of broadband pricing and supply or quality over the past six years (2011-2017) based on two sources: the U.S. Bureau of Labor Statistics ("BLS"), and standalone pricing data (standard and promotional) collected by SNL Kagan and other third parties from 20 providers offering service in approximately 40 metropolitan statistical areas.[26]

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may set a higher price and provide a lower quality of its product than would maximize societal welfare."). FBA notes this report does not discuss market power in the provision of broadband Internet access service but cites instead the terminating monopoly analysis conducted by the Commission. FBA also acknowledges that in addition to the primary indicators of market power of price and supply or quality, other factors should be examined.

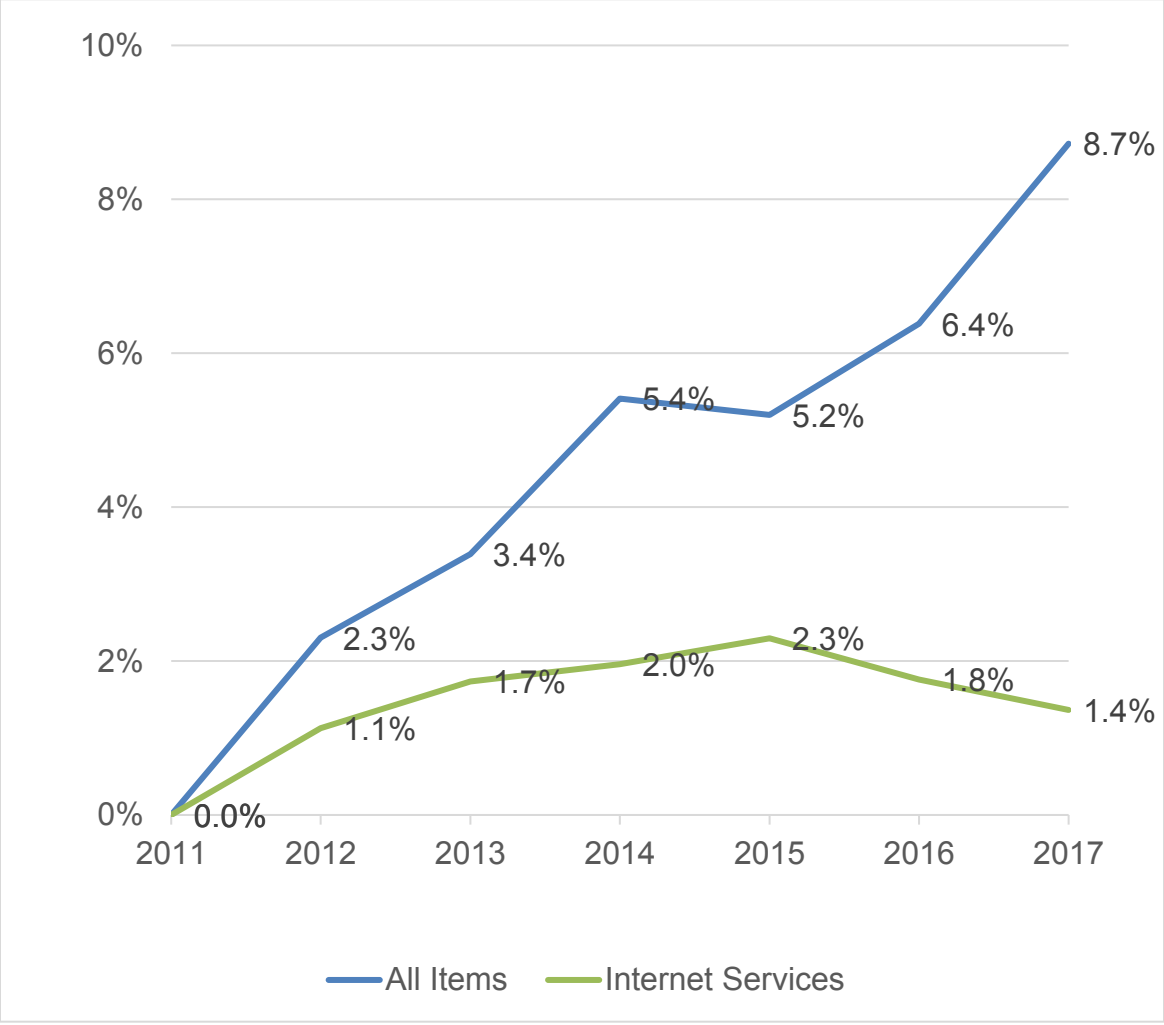
[26] FBA's analysis therefore covers the period when ISPs were first providing, as determined by the Commission, an information service and then a telecommunications service. As indicated by the findings, price and supply do not indicate that ISPs had or have market power during either period.

FBA used data on single-play standard and promotional prices for 3,287 "packages" of broadband Internet access service collected by Kagan, a media research group within S&P Global Market Intelligence, and other third-party sources from 20 wireline ISPs over the six year period, which reflect 46 distinct locations (or approximately 40 metropolitan statistical areas). The packages are weighted by ISP market shares, and the weighting changes over the six year period as market shares change. The data is weighted to more urban areas. To examine more rural areas, FBA undertook additional analyses including isolating prices offered by Suddenlink in its urban and rural markets with the Kagan data. It also undertook as an independent exercise examining prices for packages offered by larger ISPs operating in urban and rural markets by comparing current pricing in urban and rural zip codes for those providers.

FBA's analysis found —

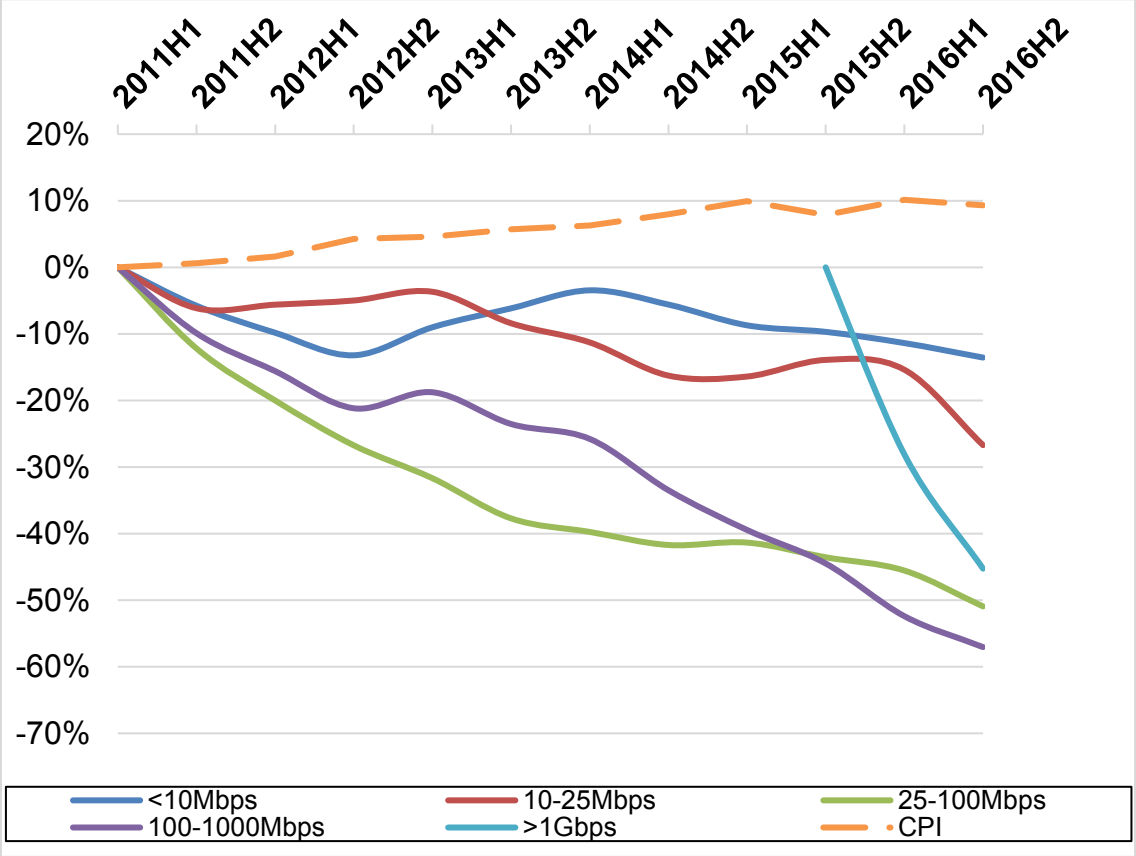
- Prices for broadband Internet access service from 2011-2017 lagged inflation. The BLS Internet services consumer price index grew by 1.4 percent during this period versus 8.7 percent for all items.

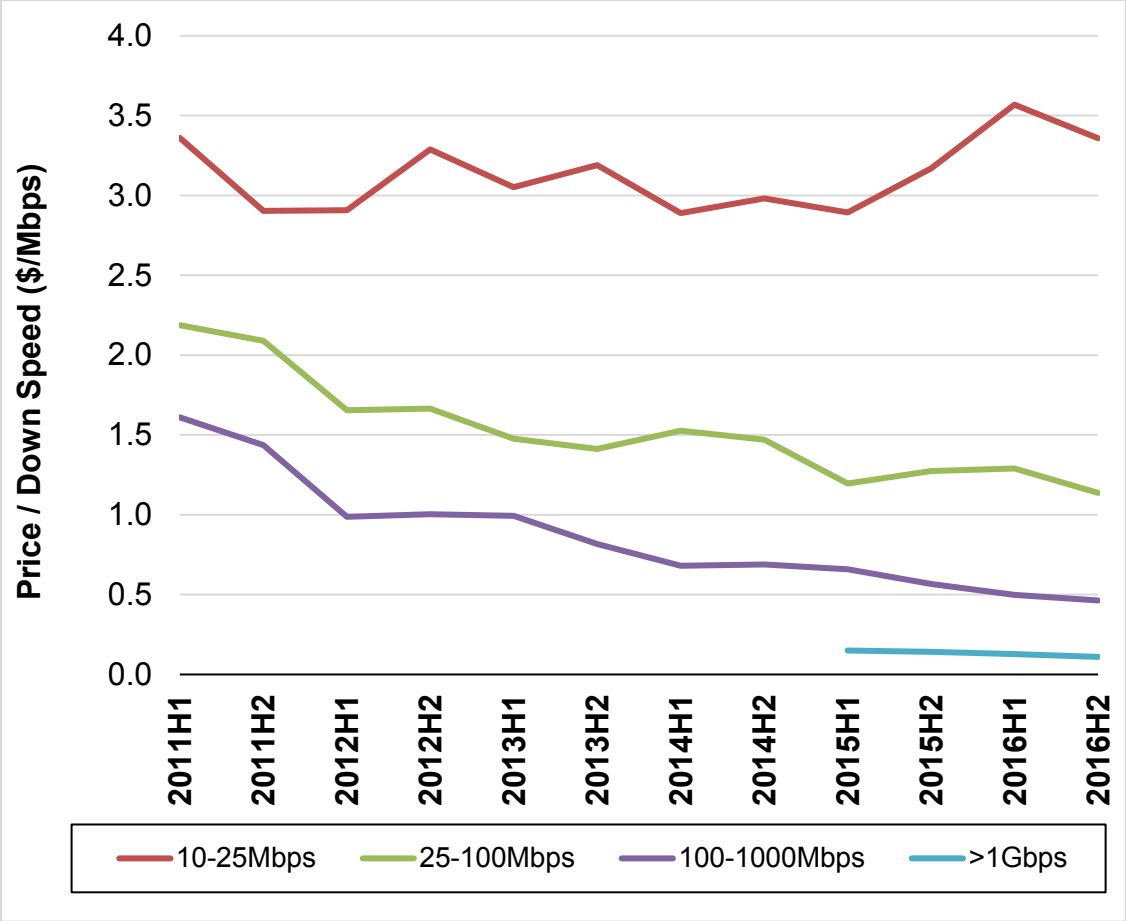
BUREAU OF LABOR STATISTICS, CPI



- Based on SNL Kagan and other third-party data, from 2011-2017, prices for broadband Internet access service declined in every speed tier, from a reduction of 14 percent for lower speed services (below 10 Mbps) to a reduction of 57 percent for higher speed services (between 100 Mbps and 1 Gbps).

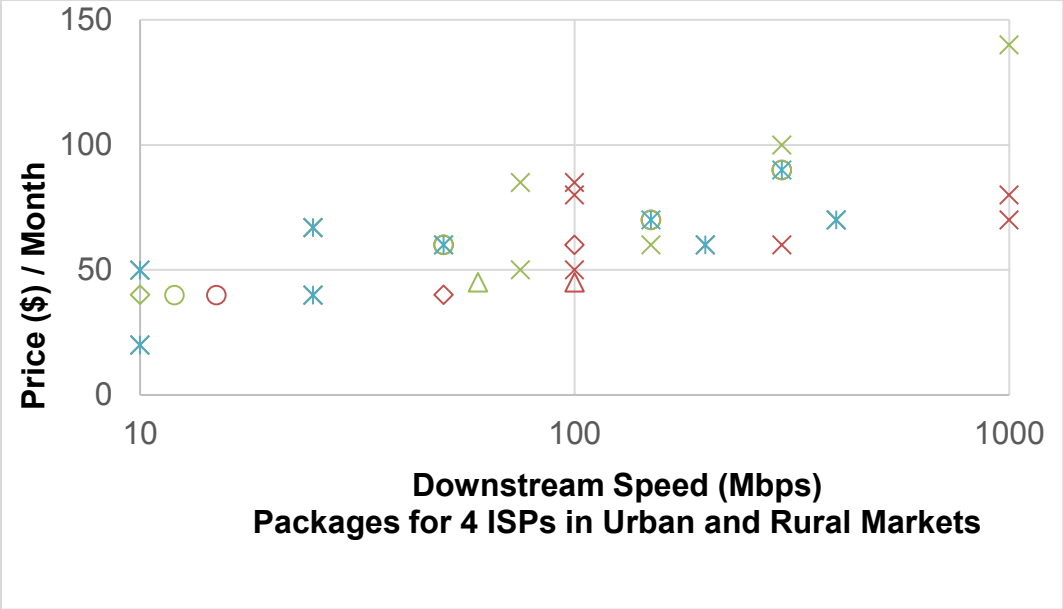
PERCENT REDUCTION IN AVERAGE PRICE/MONTH



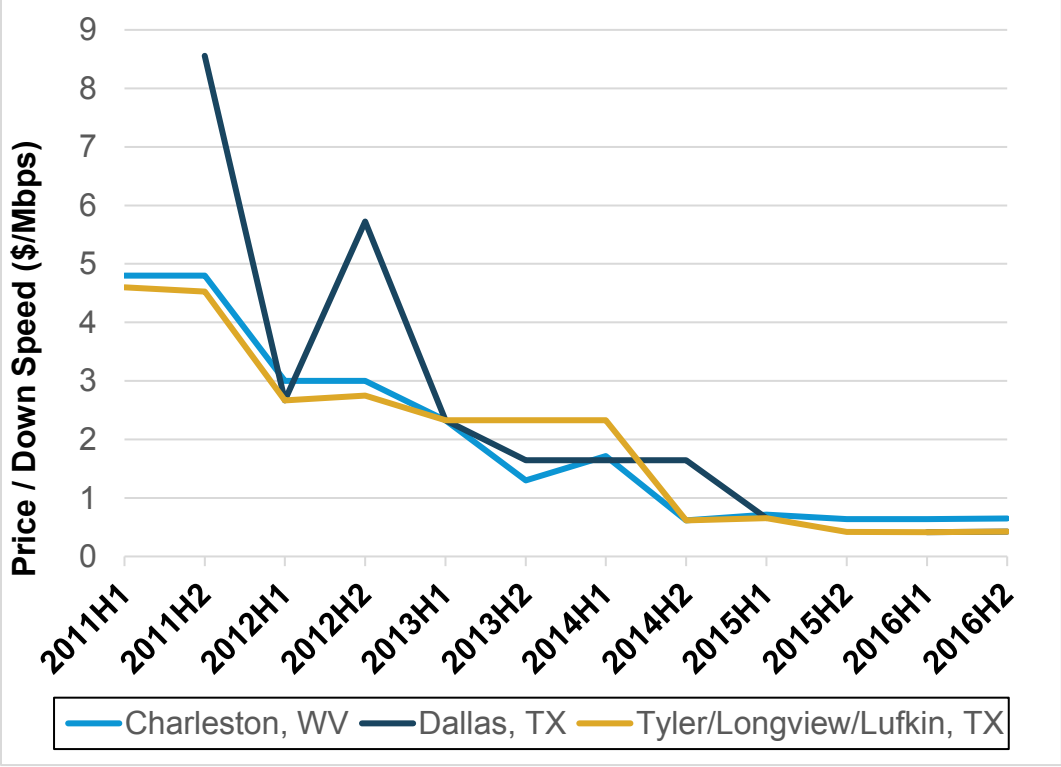


AVERAGE PRICE/DOWNSTREAM SPEED (Price/Mbps)

- Prices for broadband Internet access service in rural areas experienced similar declines to urban markets, based on a sampling of four major ISPs (Comcast, Cox, AT&T, and Charter (Time Warner)) across a variety of markets and Suddenlink in select markets.

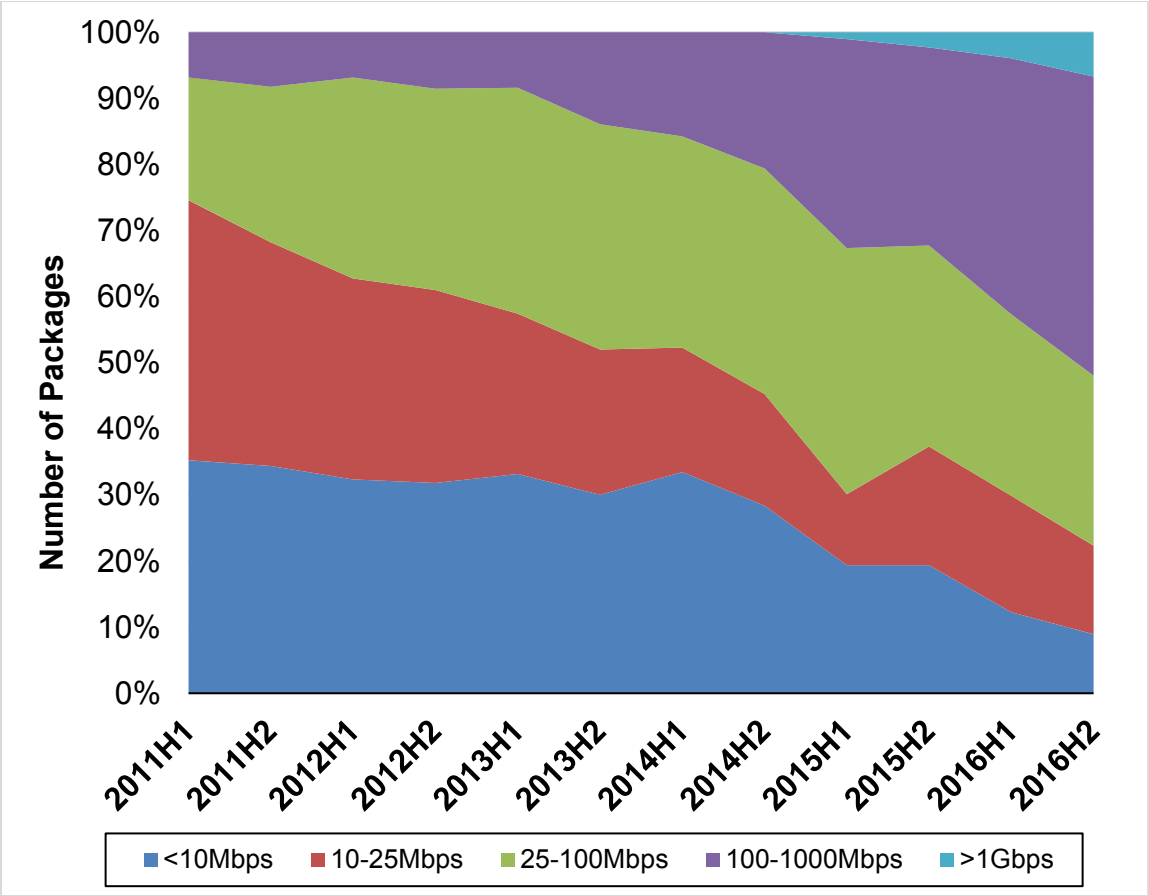


AVERAGE COST/DOWNLOAD SPEED OF TRACKED SUDDENLINK MARKETS



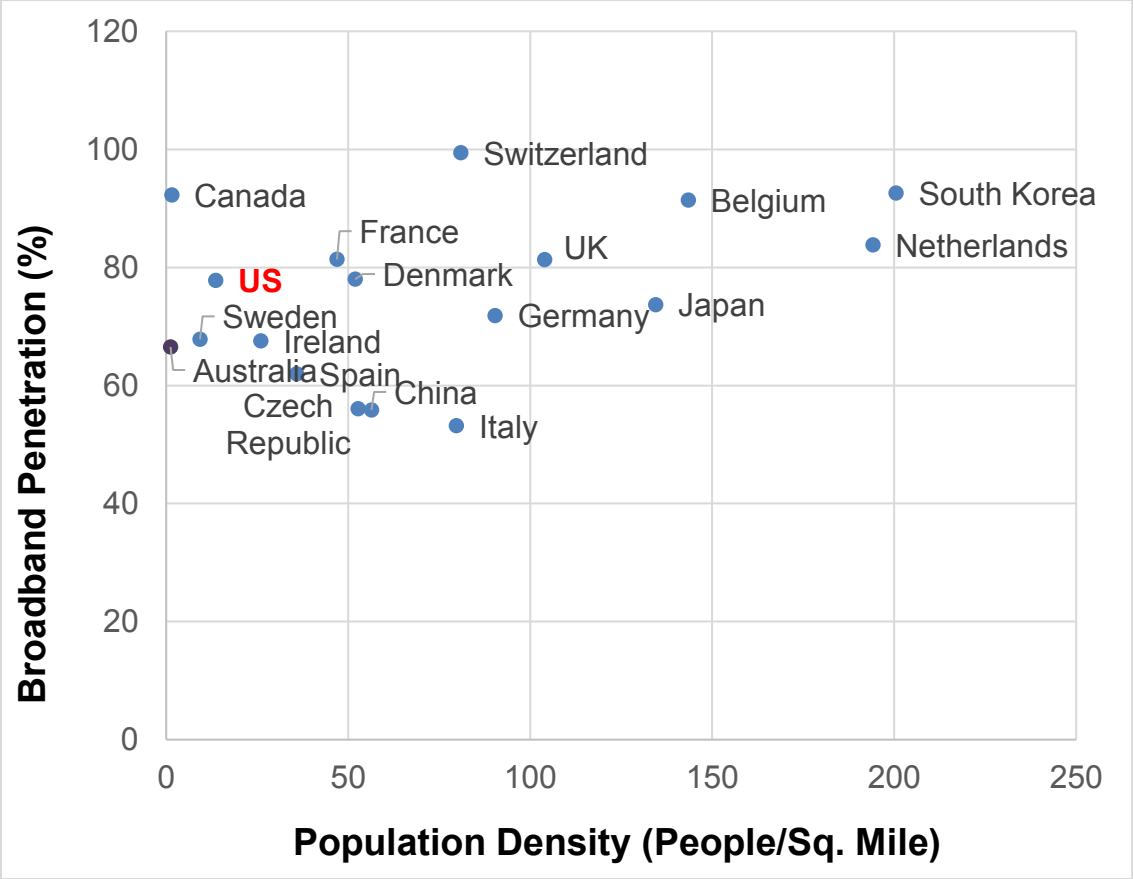
- In addition to these favorable pricing trends, ISPs have greatly expanded their higher-speed offerings. In 2011, 75 percent of tracked offerings were below 25 Mbps; today, nearly 80 percent are above 25 Mbps.

PACKAGES BY DOWNSTREAM SPEED TIER



- Finally, U.S. penetration and adoption of higher-speed services compares favorably with developed countries, especially when normalized for population density.

BROADBAND PENETRATION/POPULATION DENSITY



In sum, these declining prices and increasing supply for broadband Internet access service are the hallmarks of a functioning market, where government intervention is not warranted. Thus, the Commission, even if it had conducted a market power analysis in 2015, would not have any basis for finding that ISPs have market power – and that situation has not changed today. In fact, these critical trends show no signs of abating. There is every indication that wireline ISPs continue to reduce prices and improve their service. Moreover, wireline and wireless ISPs are invading each other's markets and, especially if the Commission undoes the

telecommunications service classification adopted in 2015, have indicated they will invest many hundreds of billions of dollars over the next decade to build dense, mesh combined wireline/wireless networks through most markets in the U.S. In such an environment, the Commission should do no harm by intervening on the premise it can improve the market. Rather, it should seek to further expand supply by removing barriers to investment and otherwise encouraging entry. Of course, there may be instances where insufficient competition exists and where investment is not sufficiently robust. In those instances, targeted government subsidies, distributed efficiently, are warranted to supplement or spur additional broadband infrastructure investment.

Respectfully Submitted,

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July 17, 2017

Broadband Pricing Trends

July 2017

Broadband prices in the U.S. have declined consistently over the last six years, both in urban areas and in rural areas, while >25 Mbps offerings have become prevalent

Key Insights on US Broadband Pricing Trends

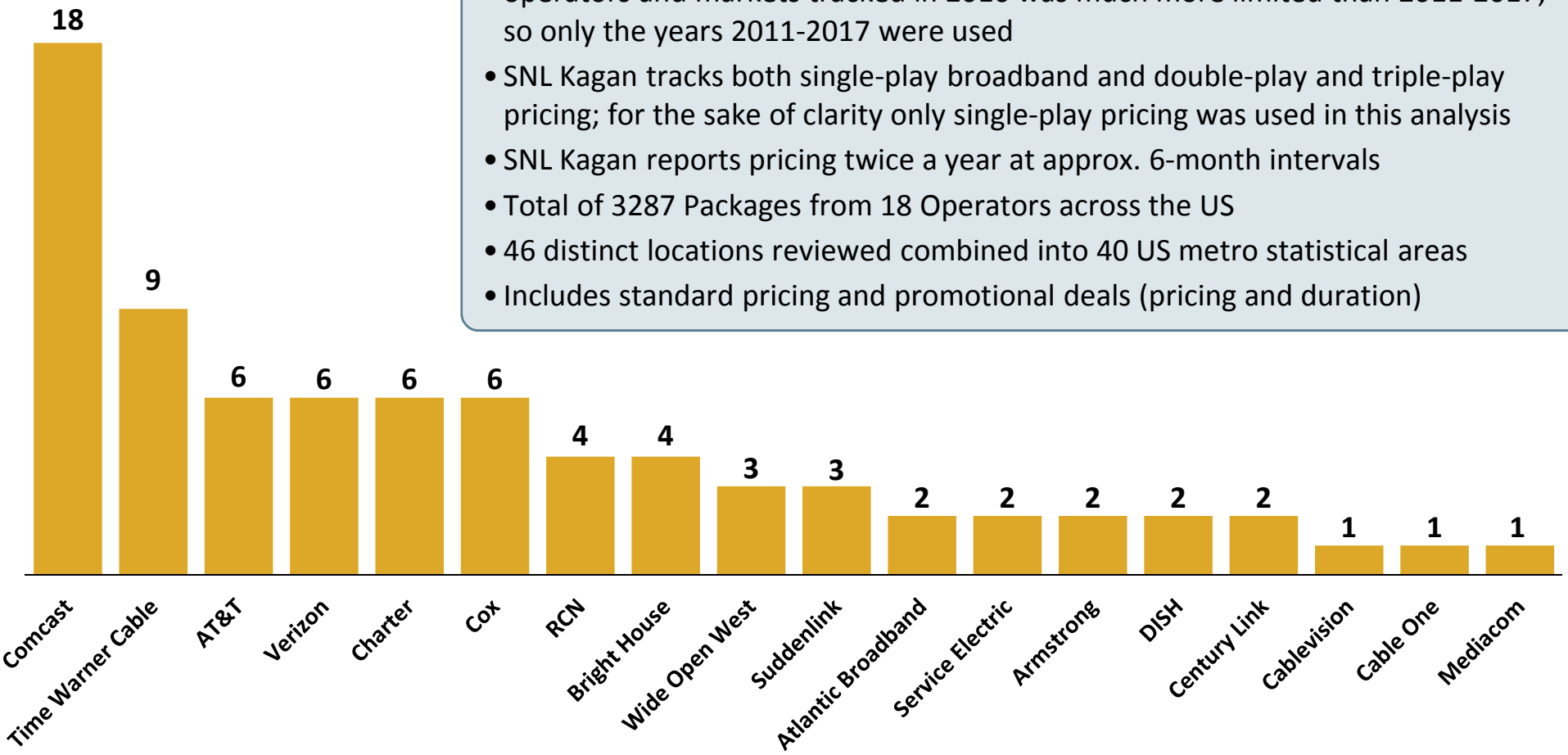
- **Broadband prices from 2011-2017 have lagged inflation**
  - The Bureau of Labor Services Internet services consumer price index ("CPI") has grown 1.4% since 2011 vs. 8.7% for all items
  - Fiber Broadband Association's analysis of SNL Kagan's data set of broadband pricing from 18 operators across 40 markets shows price declines in every speed tier, ranging from -14% for packages under 10 Mbps downstream to -57% for packages 100 Mbps-1 Gbps
- **Rural broadband prices have followed urban prices downward**
  - The most rural markets (Tyler/Longview/Lufkin, TX; Charleston, WV) in SNL Kagan's data set showed price declines just as significant as large urban markets
  - Current rural broadband prices are comparable to current urban broadband prices, based on a sampling of four operators
- **Broadband providers have significantly expanded their higher-speed offerings**
  - Of the packages tracked by SNL Kagan, more than 75% were under 25 Mbps downstream in 2011; by 2017, nearly 80% were above 25 Mbps
- **U.S. broadband penetration and adoption of higher speeds compares favorably with high-income countries, especially when normalized for population density**
  - 55% of U.S. broadband subscribers subscribe to packages 30 Mbps and above vs. 46% in western Europe

Fiber Broadband ASSOCIATION

Our data set of historical broadband pricing drew from 18 operators with samples from a range of different markets across the US

Locations by Operator in SNL Kagan Broadband Pricing Data Set, All Periods [1]

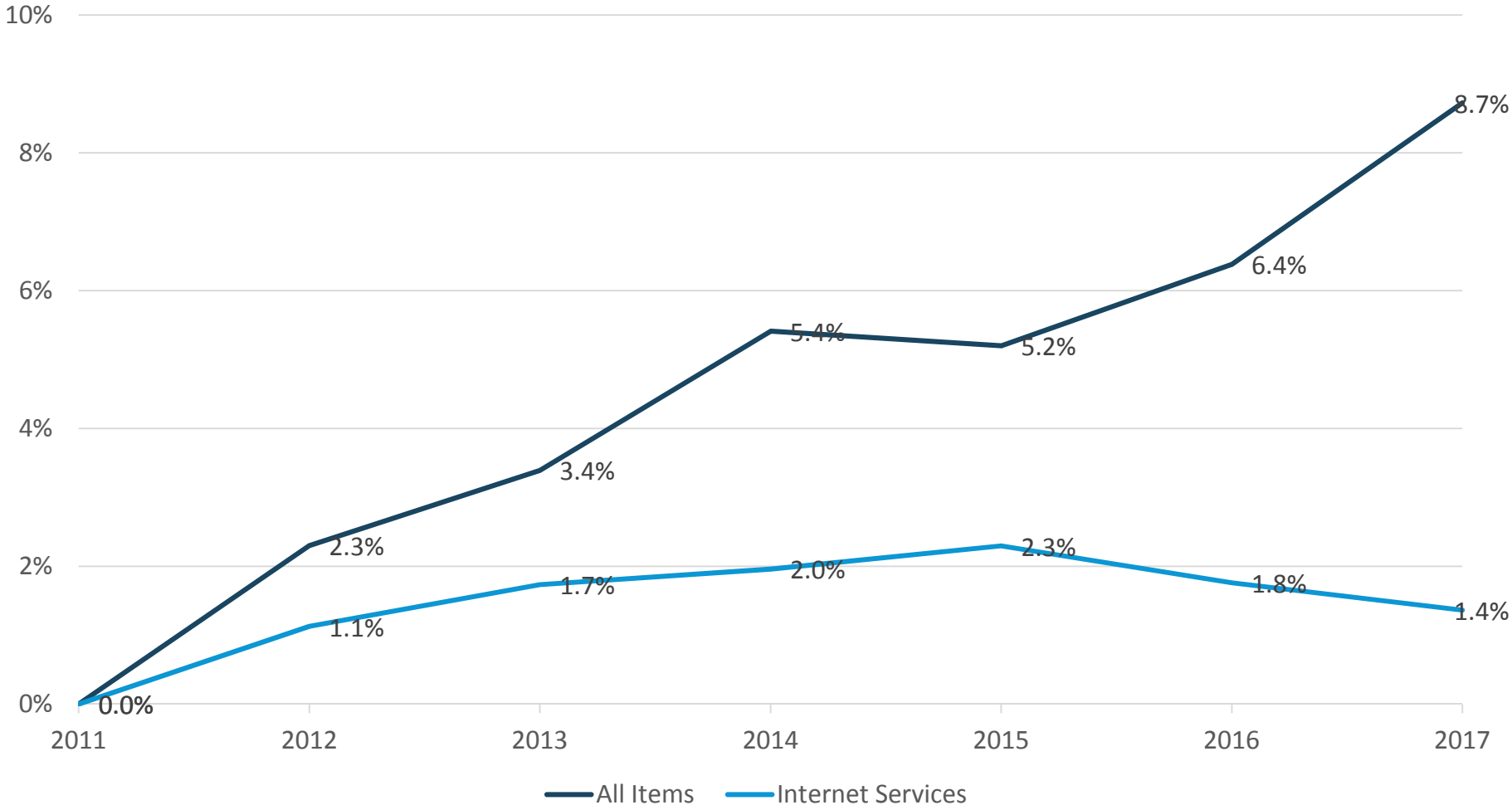
- SNL Kagan has tracked broadband prices since 2010, but the number of operators and markets tracked in 2010 was much more limited than 2011-2017, so only the years 2011-2017 were used
- SNL Kagan tracks both single-play broadband and double-play and triple-play pricing; for the sake of clarity only single-play pricing was used in this analysis
- SNL Kagan reports pricing twice a year at approx. 6-month intervals
- Total of 3287 Packages from 18 Operators across the US
- 46 distinct locations reviewed combined into 40 US metro statistical areas
- Includes standard pricing and promotional deals (pricing and duration)



Note: Findings based on FBA's analysis of Kagan & other 3rd-party data

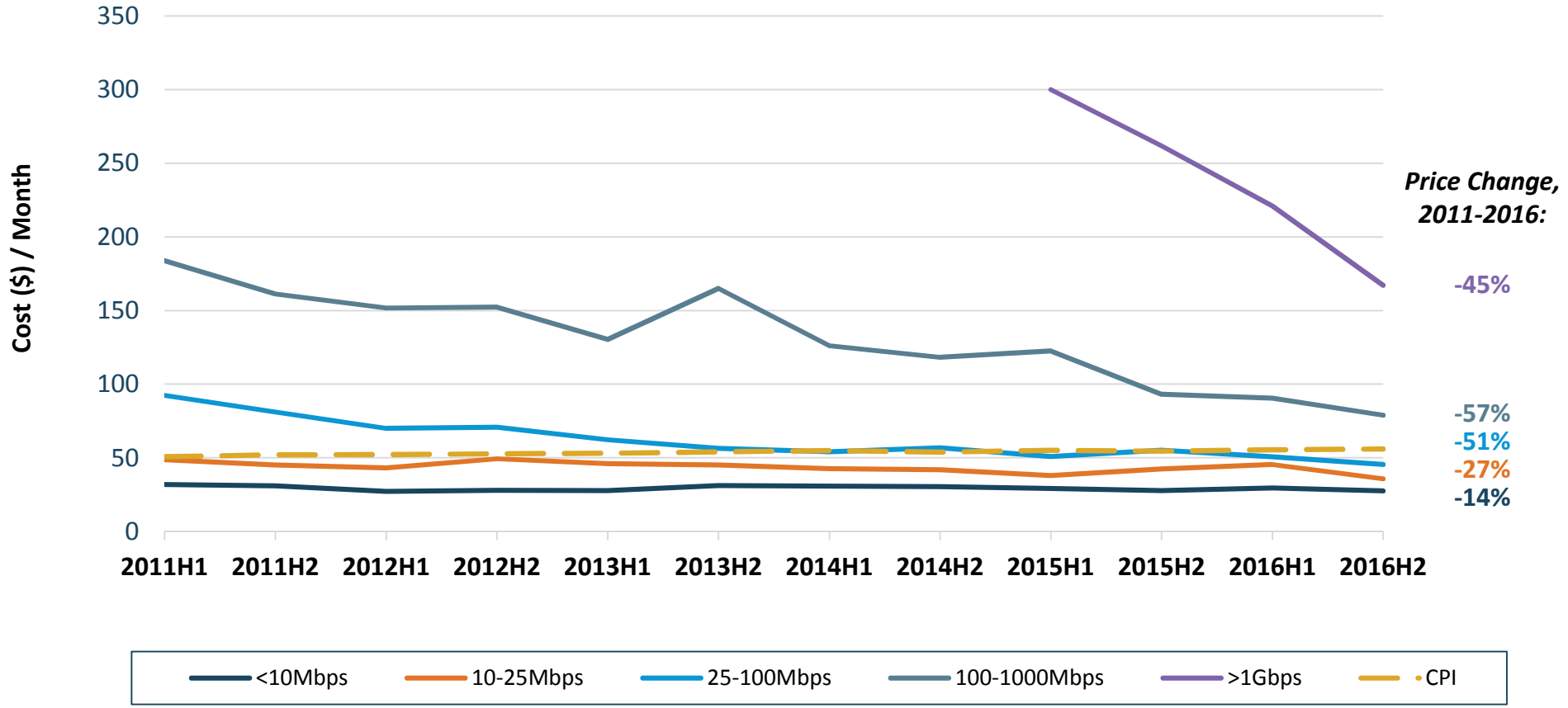
The Bureau of Labor Statistics' CPI for Internet services has grown much more slowly than the CPI for all items

Bureau of Labor Statistics CPI [5]



While overall prices have barely grown, prices for every speed tier have declined—demonstrating that consumers have received increasing value for their money

Average Cost / Month (12 Months incl. Promotions) [1,5]

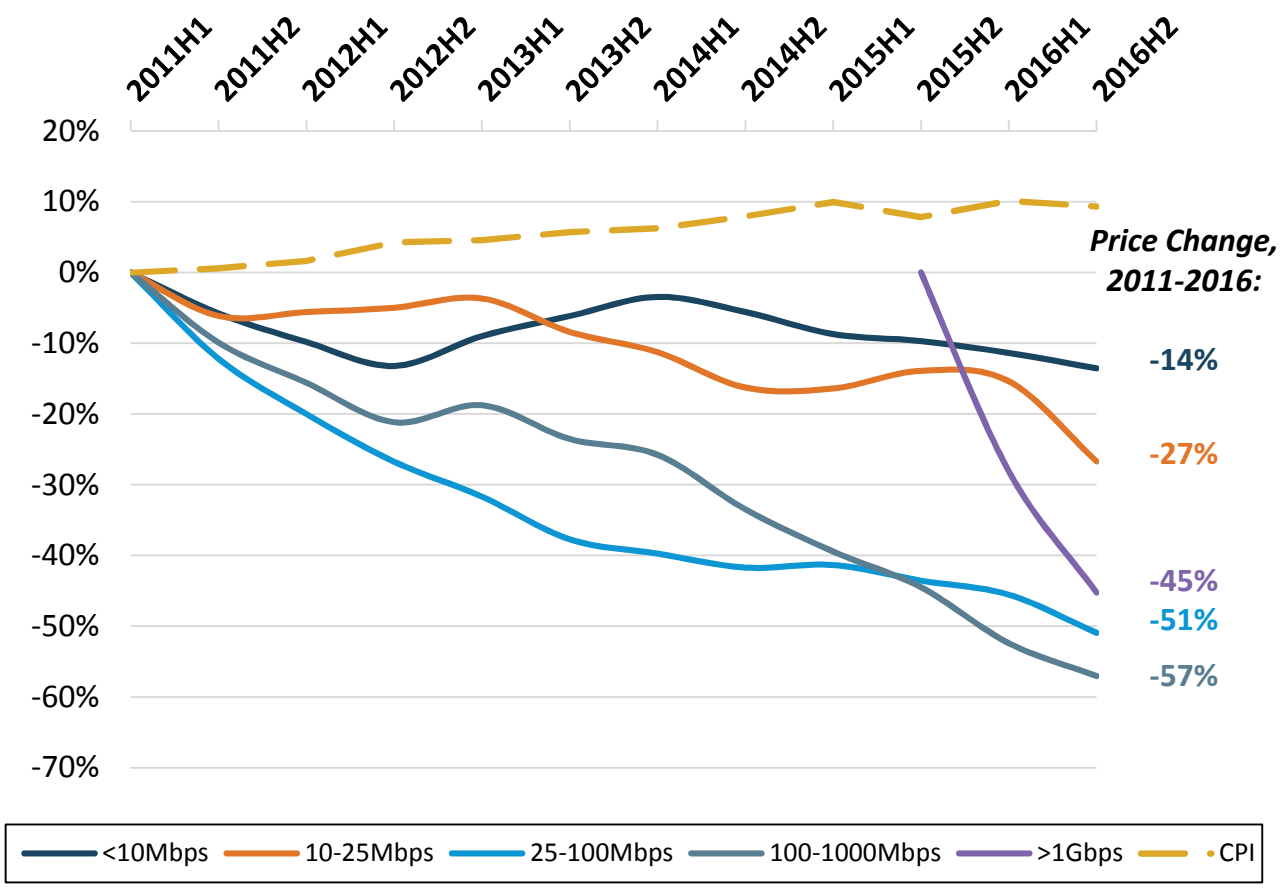


Note: CPI calculated as equivalent cost of a $50/month package adjusted for inflation

Note: Findings based on FBA's analysis of Kagan & other 3rd-party data

Prices have largely been on a consistent downward trend every six months across all speed tiers

Average Cost / Month (12 Months), % Reduction [1,5]



Additional Commentary

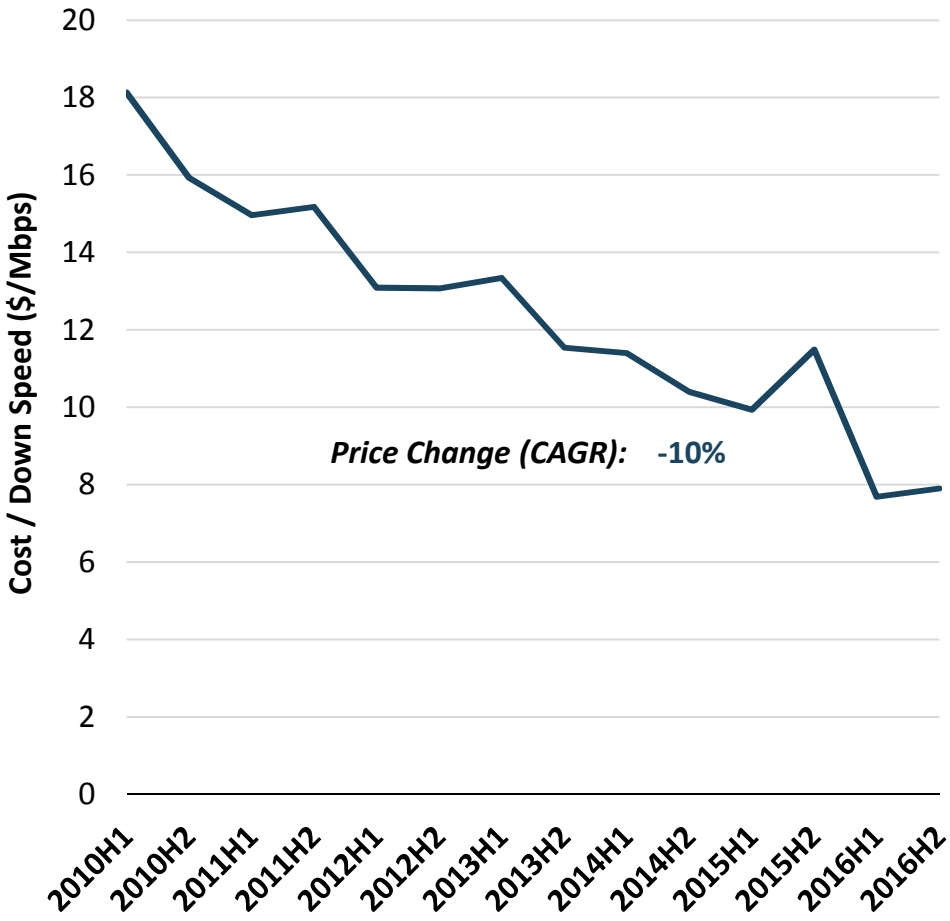
- For any given speed, costs have decreased for consumers since 2011
- Cost trends shown as 18-month pricing rolling average
- Packages <25Mbps have fallen by an average of 20% since 2011
- Packages 25Mbps – 1Gbps have fallen by an average of 54% since 2011
- There are no dramatic price changes as a result of the Open Internet Order issued in Feb. 2015

Note: Uptick in <10Mbps pricing due to AT&T price increase across a range of packages for all locations, representing 45% of sampled packages in those periods

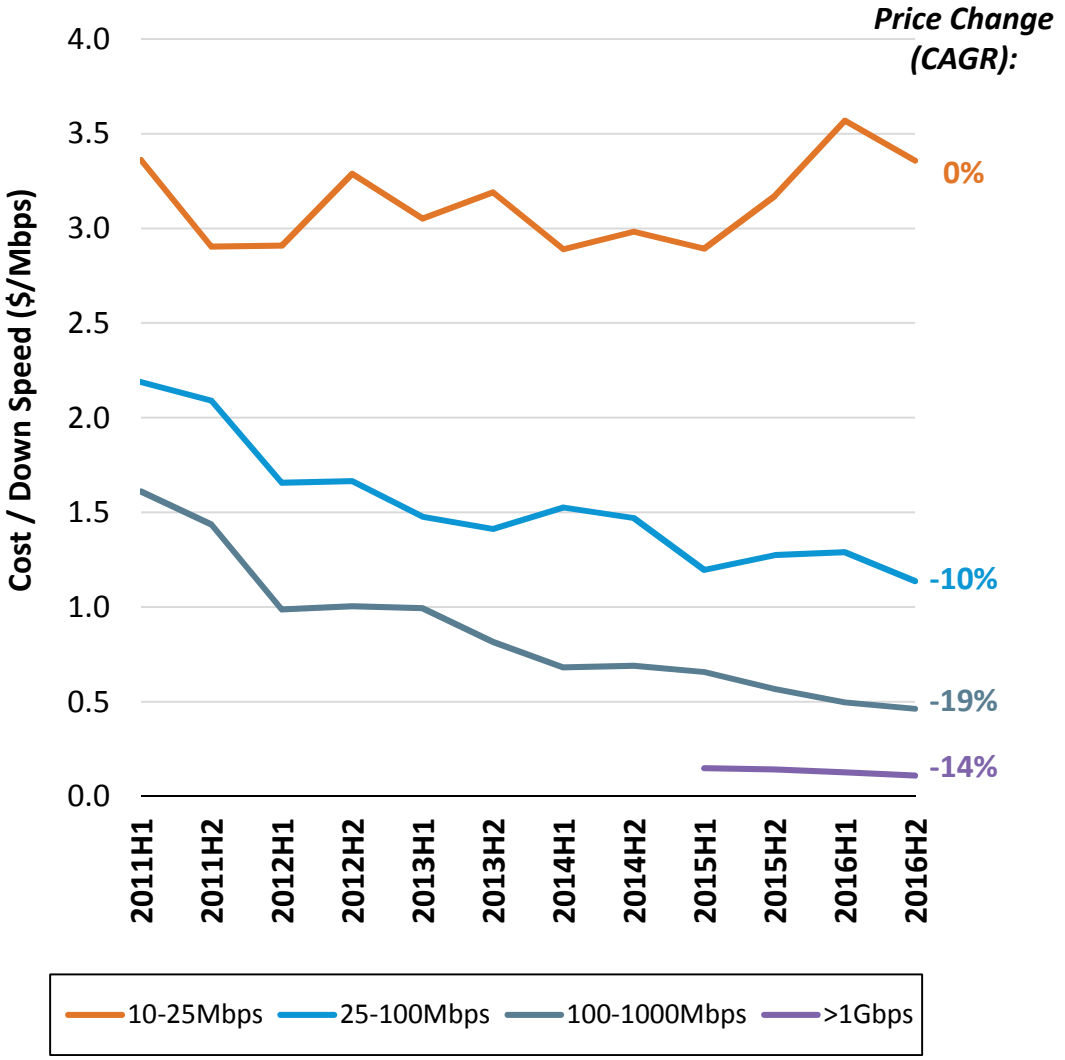
Note: Findings based on FBA's analysis of Kagan & other 3rd-party data

On a per-Mbps basis, prices have declined in both nominal or real terms across all speed tiers

Average Cost / Down Speed (<10Mbps) [1]



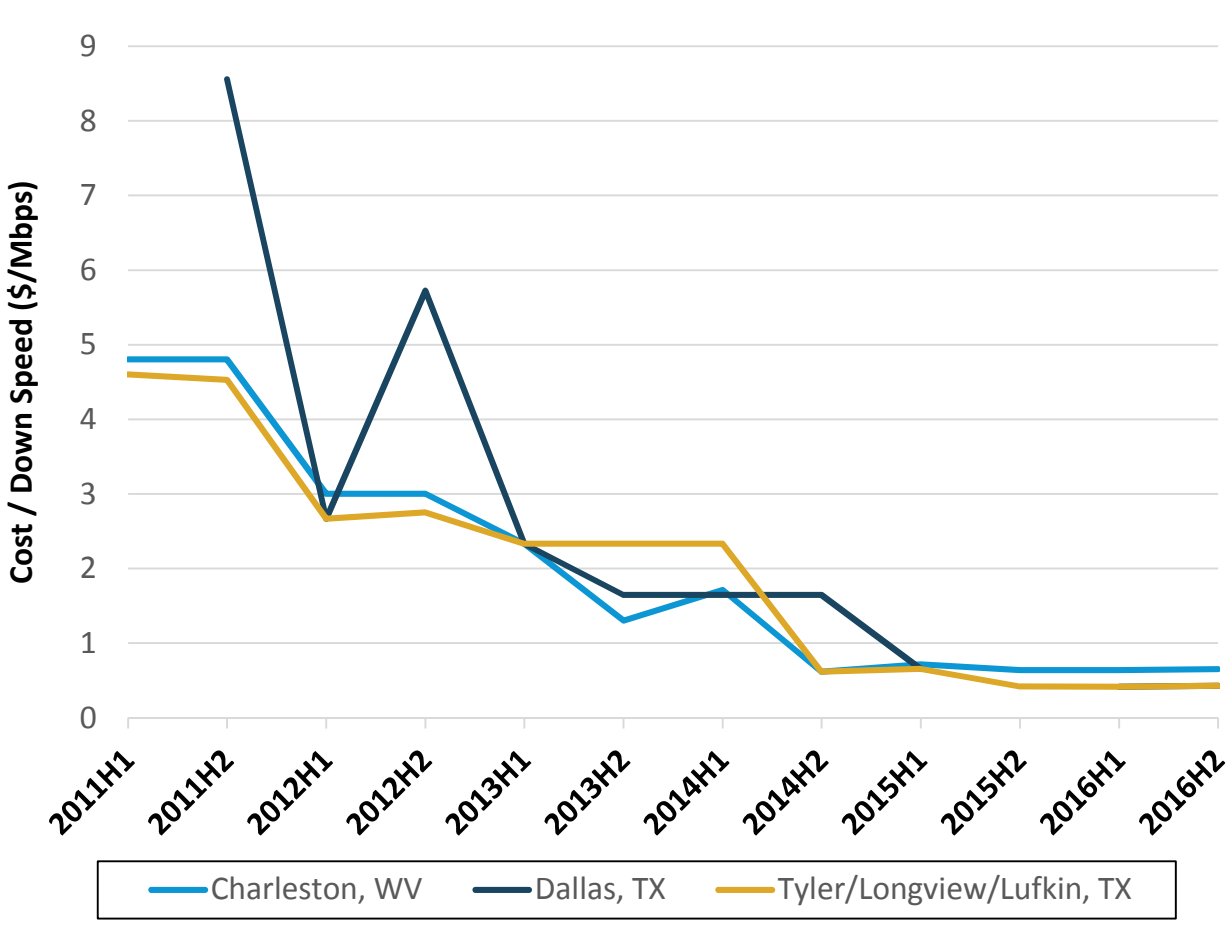
Average Cost / Down Speed (>10Mbps) [1]



Note: Findings based on FBA's analysis of Kagan & other 3rd-party data

The most rural markets in the data set show price declines similar to the declines seen in large urban markets served by the same operator

Average Cost / Down Speed of Tracked Suddenlink Markets



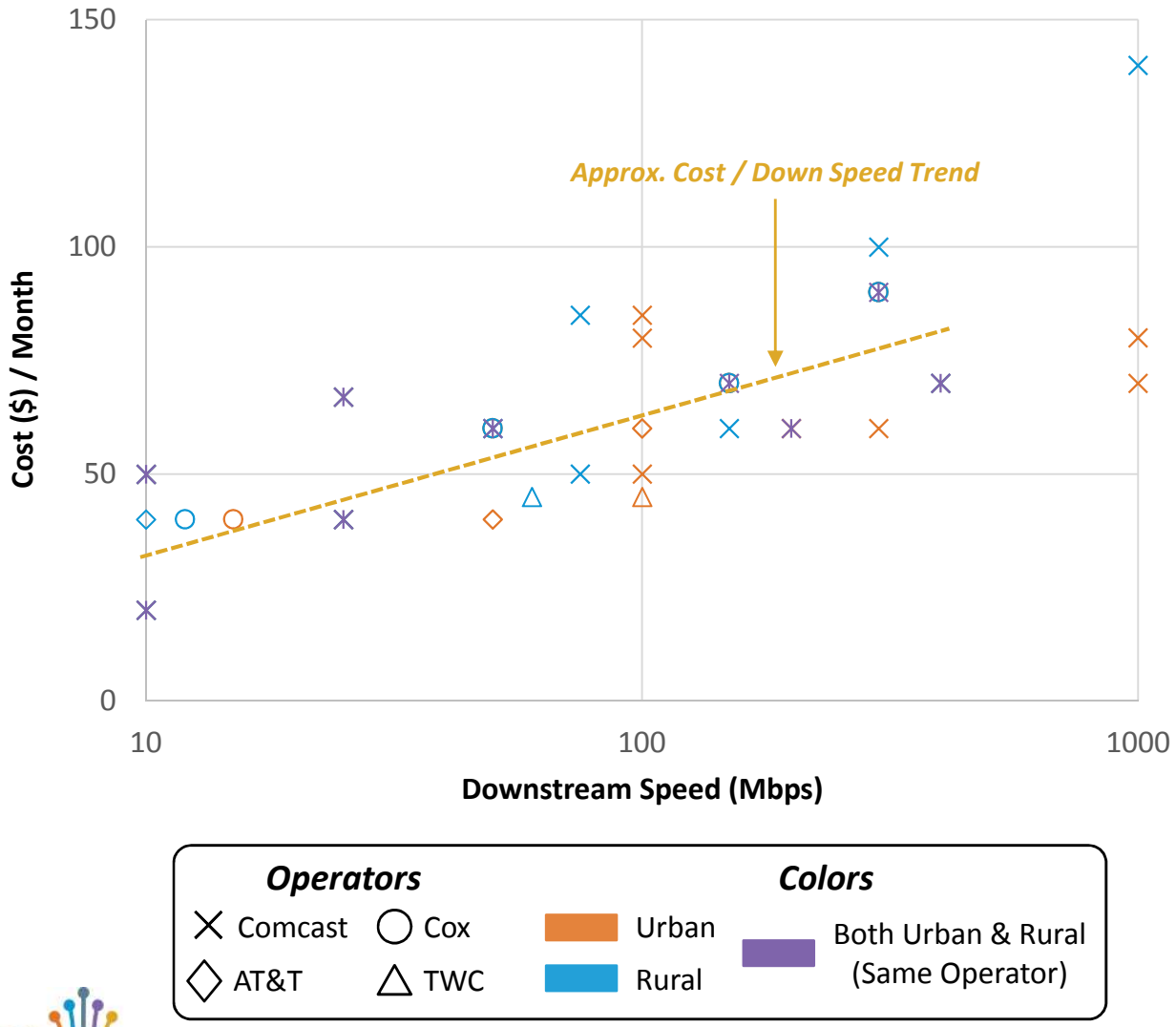
Additional Commentary

- Tyler/Longview/Lufkin is a more rural area with >37% of the population living outside cities
- In comparison with other geographies served by the same operator, the pricing in the Less Urban geographies matches that of the Most Urban geography of Dallas, TX
- Despite the initial fluctuations where prices in the Most Urban area of Dallas were higher than prices in Charleston and Tyler/Longview/Lufkin, pricing across all three geographies has been quite consistent over the last 3-4 years

Note: Findings based on FBA's analysis of Kagan & other 3rd-party data

A sampling of current broadband prices in rural and urban areas for four major operators demonstrates that prices are similar in both areas

Cost vs. Downstream Speed [7]



Additional Commentary

- A number of packages offered in Rural areas were identical to the same speed package offered in Urban areas (purple marks on the chart)
- For those packages that did differ between Urban and Rural areas, from the same operators, there is no clear trend of either Urban or Rural locations offering higher or lower prices for similar speed tiers

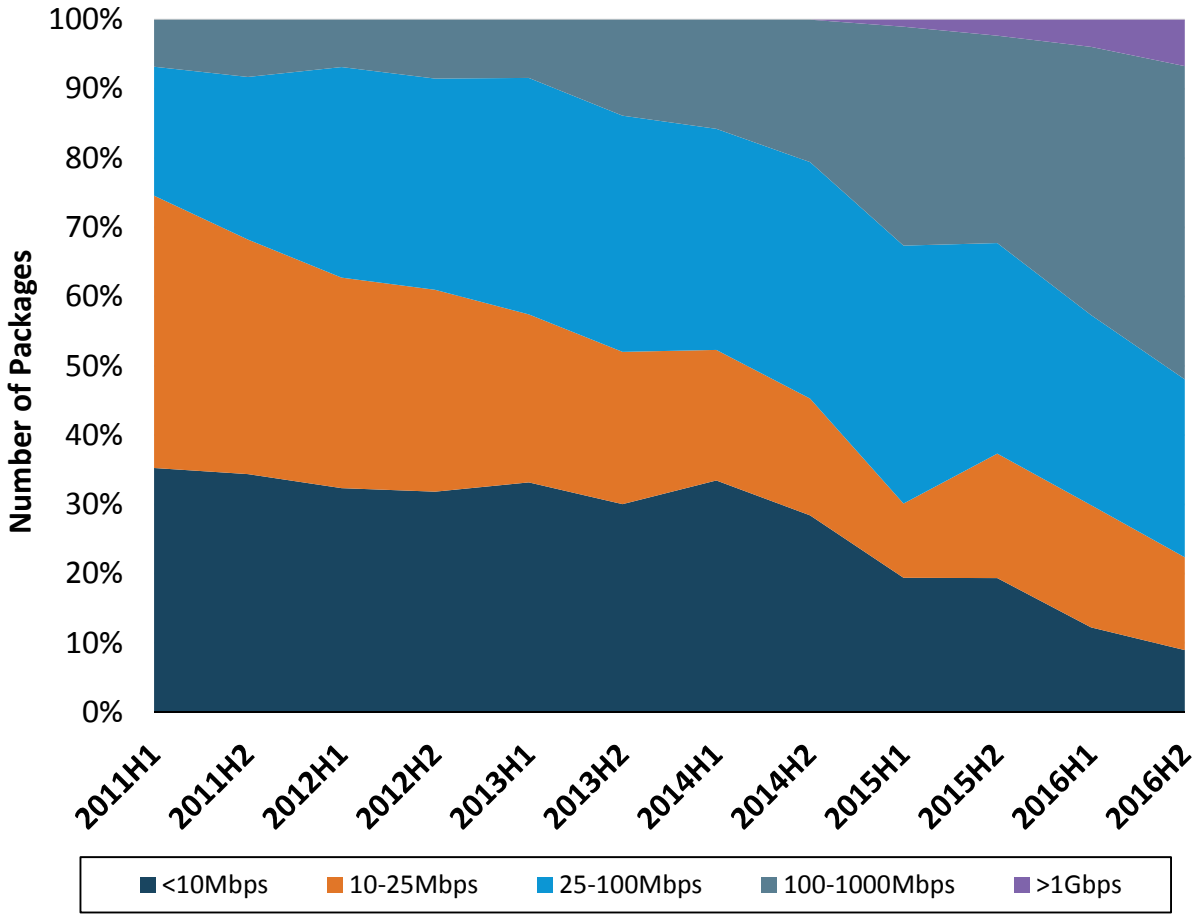
Operators & Locations

Operator	MSA	Zip Codes
COMCAST	• Atlanta, GA • Boston, MA	30303, 02113 (Urban) 30276, 01764 (Rural)
Time Warner Cable	• Los Angeles, CA	90014 (Urban) 93535 (Rural)
COX	• Phoenix, AZ	85034 (Urban) 85390 (Rural)
at&t	• Chicago, IL	60620 (Urban) 60442 (Rural)

Fiber Broadband ASSOCIATION

Consistent with other industry benchmarks, the share of tracked broadband packages has shifted considerably from lower-tier speeds (e.g. 0-25Mbps) to 100Mbps+ speeds

Packages by Download Speed Tier [1]



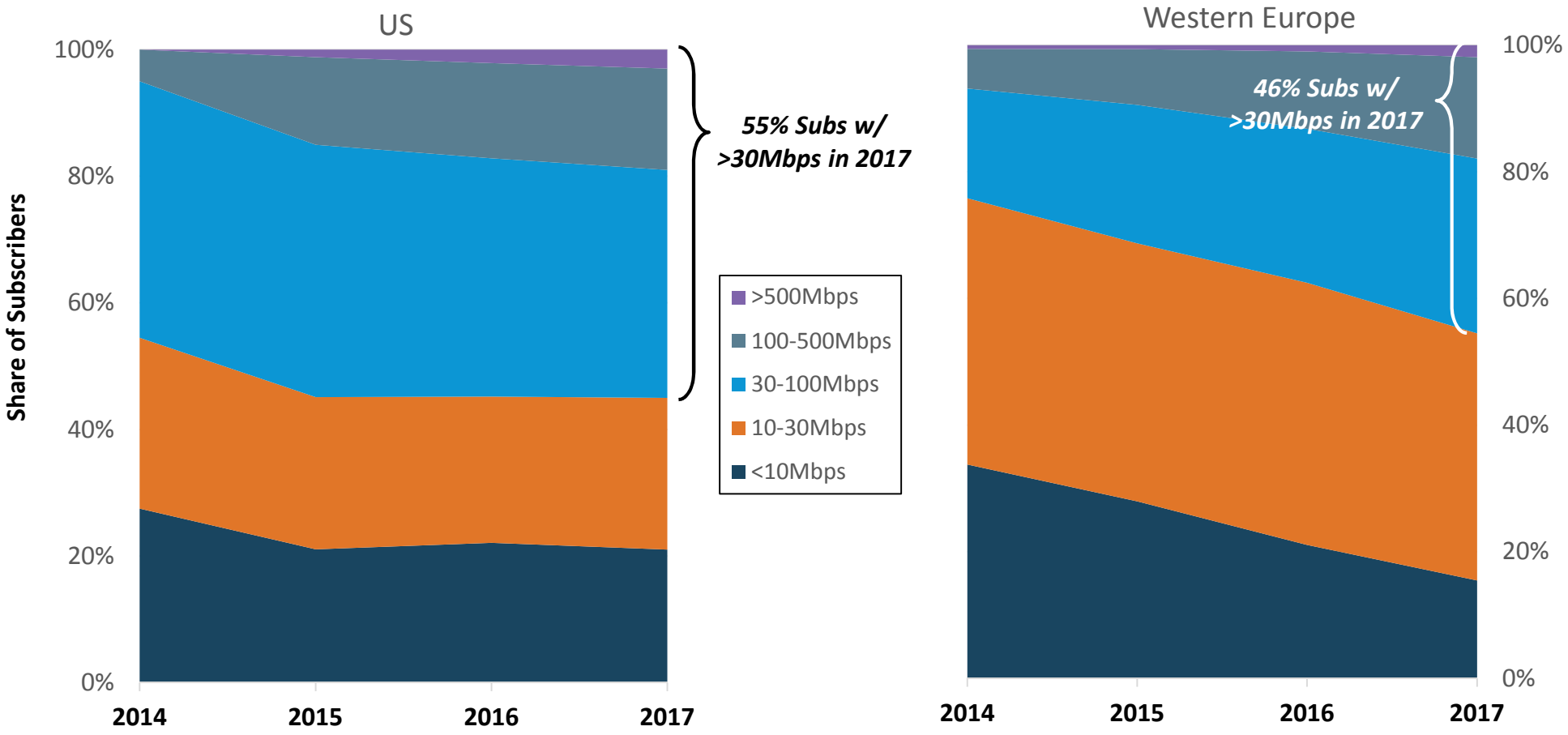
Additional Commentary

- In 2016H2 78% of packages offered were over 25Mbps and 52% were over 100Mbps
- Investment is leading to consumers being offered a range of higher speed packages

Note: Findings based on FBA's analysis of Kagan & other 3rd-party data

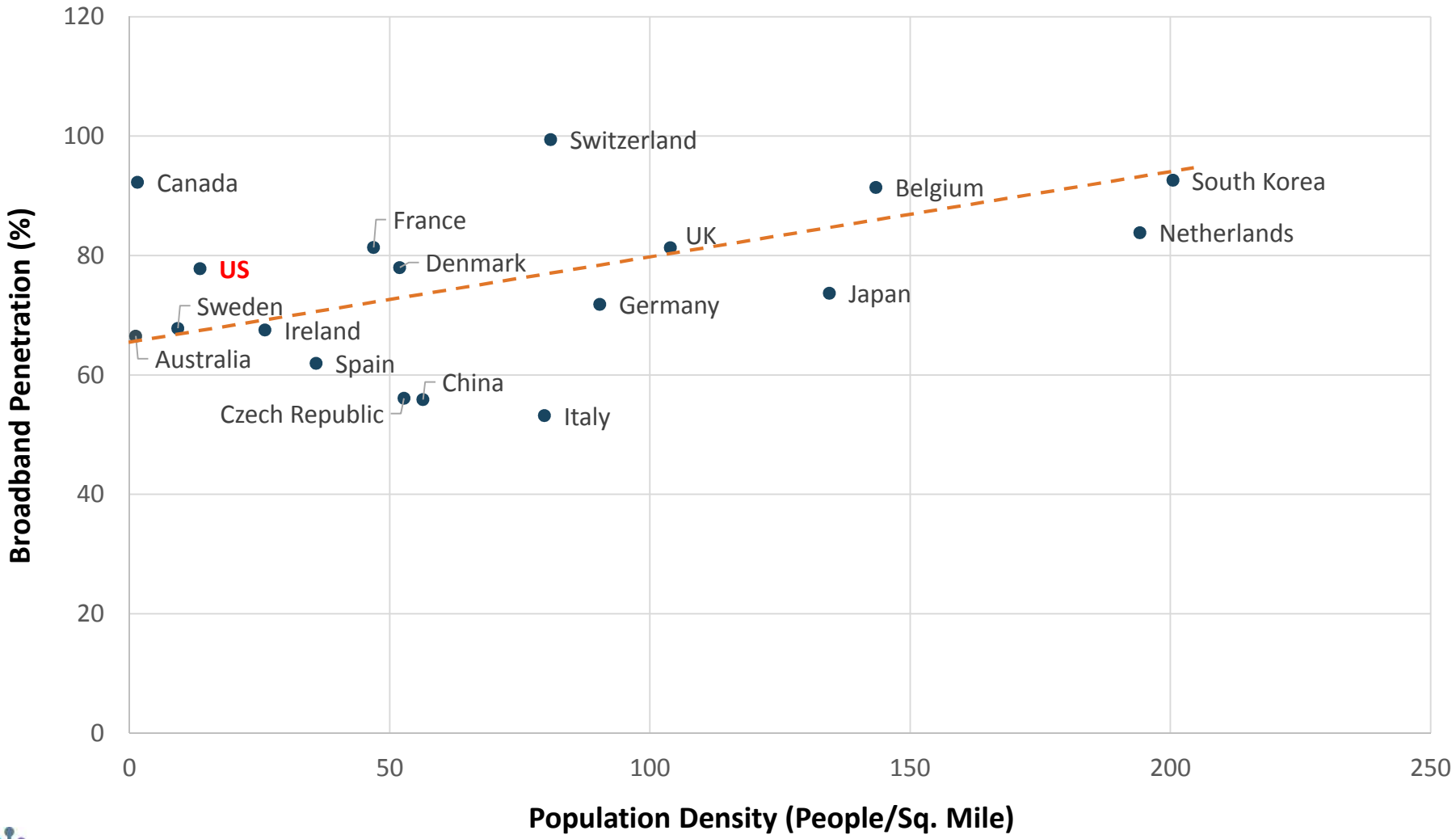
The US compares favorably with respect to share of total subscribers for higher-tier Internet speeds in relation to Western European counterparts

Subscribers by Speed, 2014-2017 [3]



The US, with a lower population density relative to many developed countries, has proportionally higher broadband penetration than many peers with higher pop. density

Broadband Penetration / Population Density [3,4]



Data from preceding charts based on the following data sources:

1. "Multichannel High-Speed Data Pricing Report," Kagan, a media research group within S&P Global Market Intelligence (subscription required) https://www.snl.com/web/client?auth=inherit#news/document?id=40211669&KeyProductLinkType=2

2. "2010 Census Urban and Rural Classification and Urban Area Criteria" United States Census Bureau https://www.census.gov/geo/reference/ua/urban-rural-2010.html

3. "Consumer Broadband Subscription and Revenue Forecast: 2016-21" Ovum (subscription required)

4. "Population density (people per sq. km of land area)" World Bank http://data.worldbank.org/indicator/EN.POP.DNST

5. "CPI Detailed Report" Bureau of Labor Statistics https://www.bls.gov/cpi/cpi_dr.htm#2017

6. "Multichannel Operators," Kagan, a media research group within S&P Global Market Intelligence (subscription required)

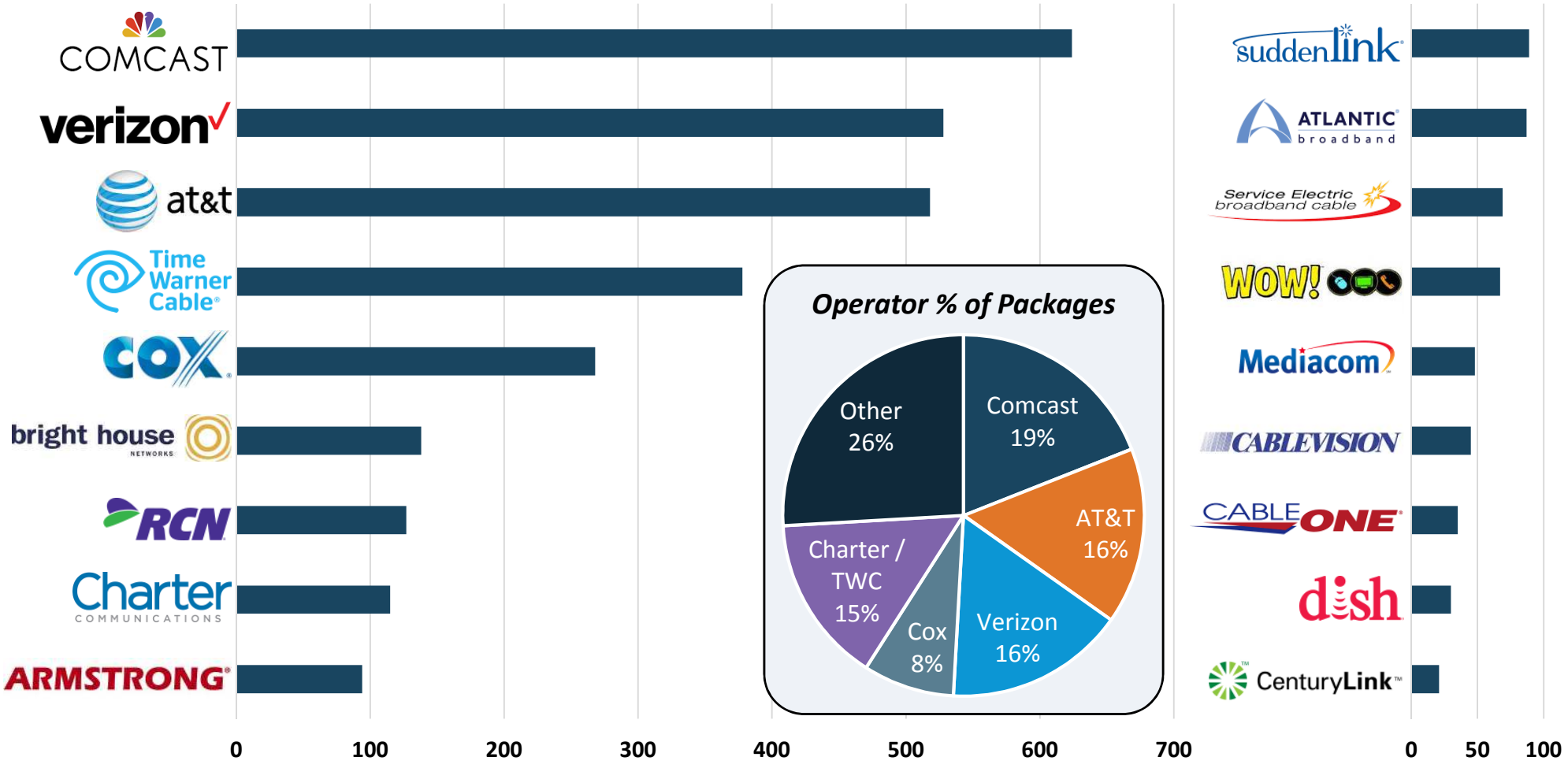
7. Company Websites (Comcast, AT&T, TWC/Charter, Cox) for latest pricing data

Accelerating the Connected Future

Methodology

The aggregated data used for analysis was based on a wide selection of operators, more heavily weighted towards the operators with larger shares of the fixed market

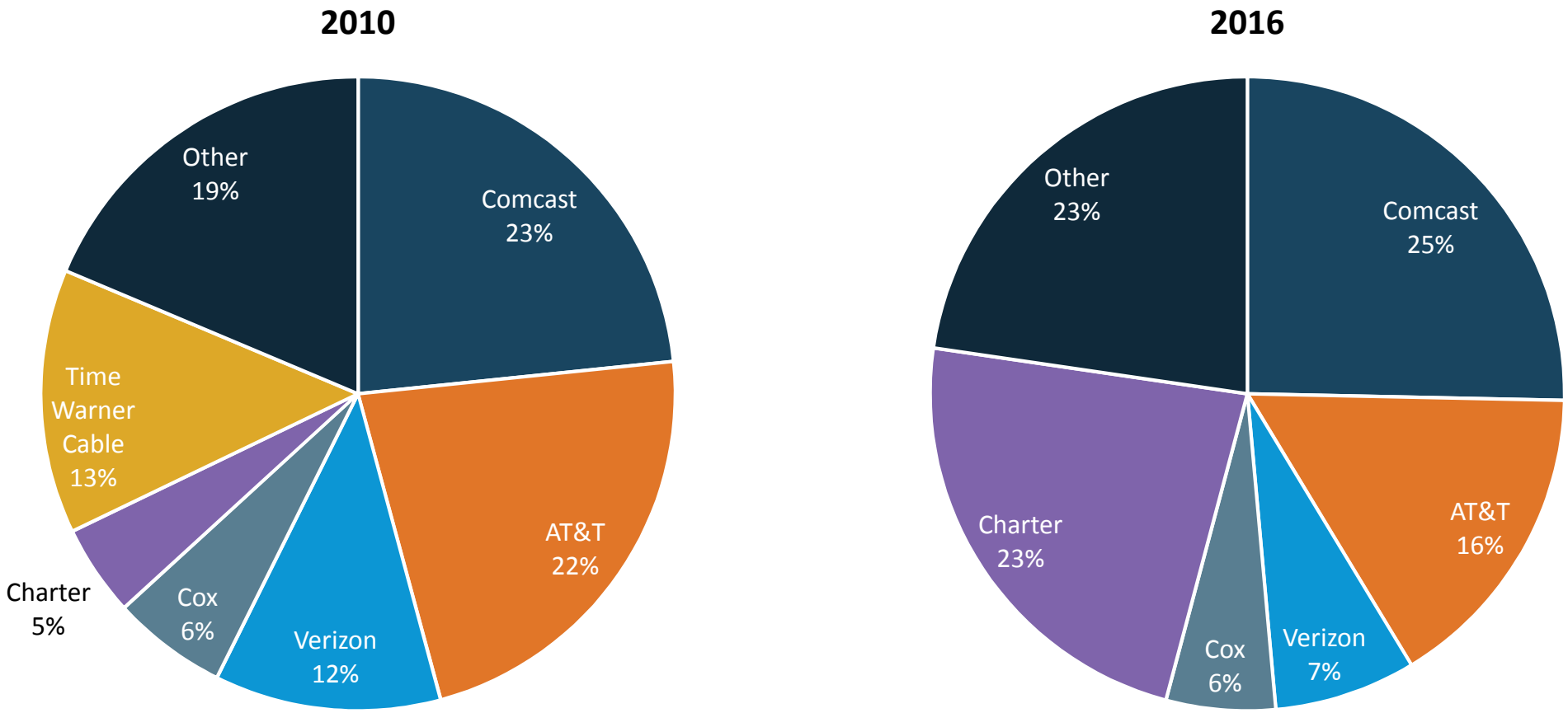
Number of Tracked Packages by Operator, All Data Periods [1]



Note: Findings based on FBA's analysis of Kagan & other 3rd-party data

The overall cross-section of operators represented in the pricing data reflects the changing mix of operator market in the US over the period of the pricing data

US Fixed Line Broadband Market Shares, 2010 & 2016 [6]



Operator shares of tracked packages are roughly in line with respective market shares, suggesting selected packages are representative of the market

Note: Findings based on FBA's analysis of Kagan & other 3rd-party data

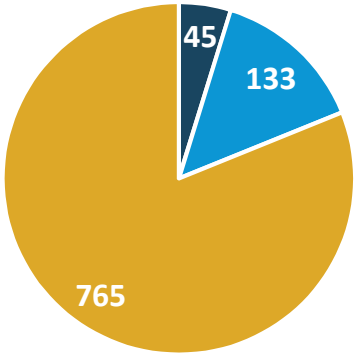
Compared to the US as a whole, the available dataset over-represents urban cities as a proportion of total MSAs, and under-represents the urban population in general

Geographic Definitions

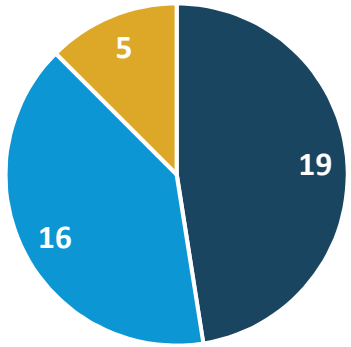
"Most Urban"	• Areas where >95% of population live in urban areas • All within the top 50 most populated cities in the US
"More Urban"	• Areas where 80%-95% of population live in urban areas • 15 are within the top 50 most populated cities in the US
"Less Urban"	• Areas where <80% of population live in urban areas

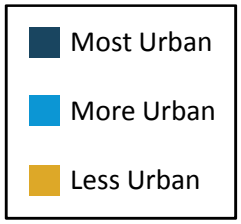
Total US Data vs. SNL Dataset

Count MSA US Census [2]

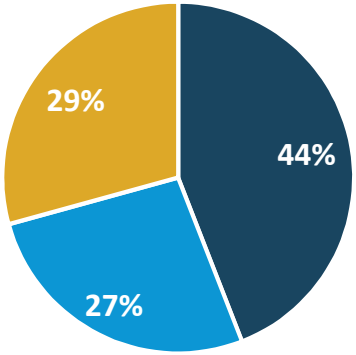


Count MSA Dataset [1,2]

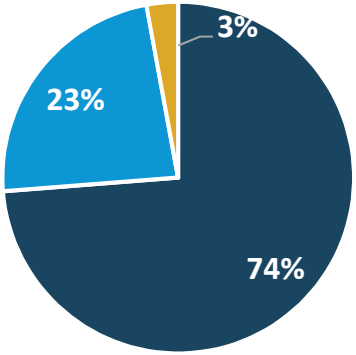




Population US Census [2]



Population Dataset [1,2]

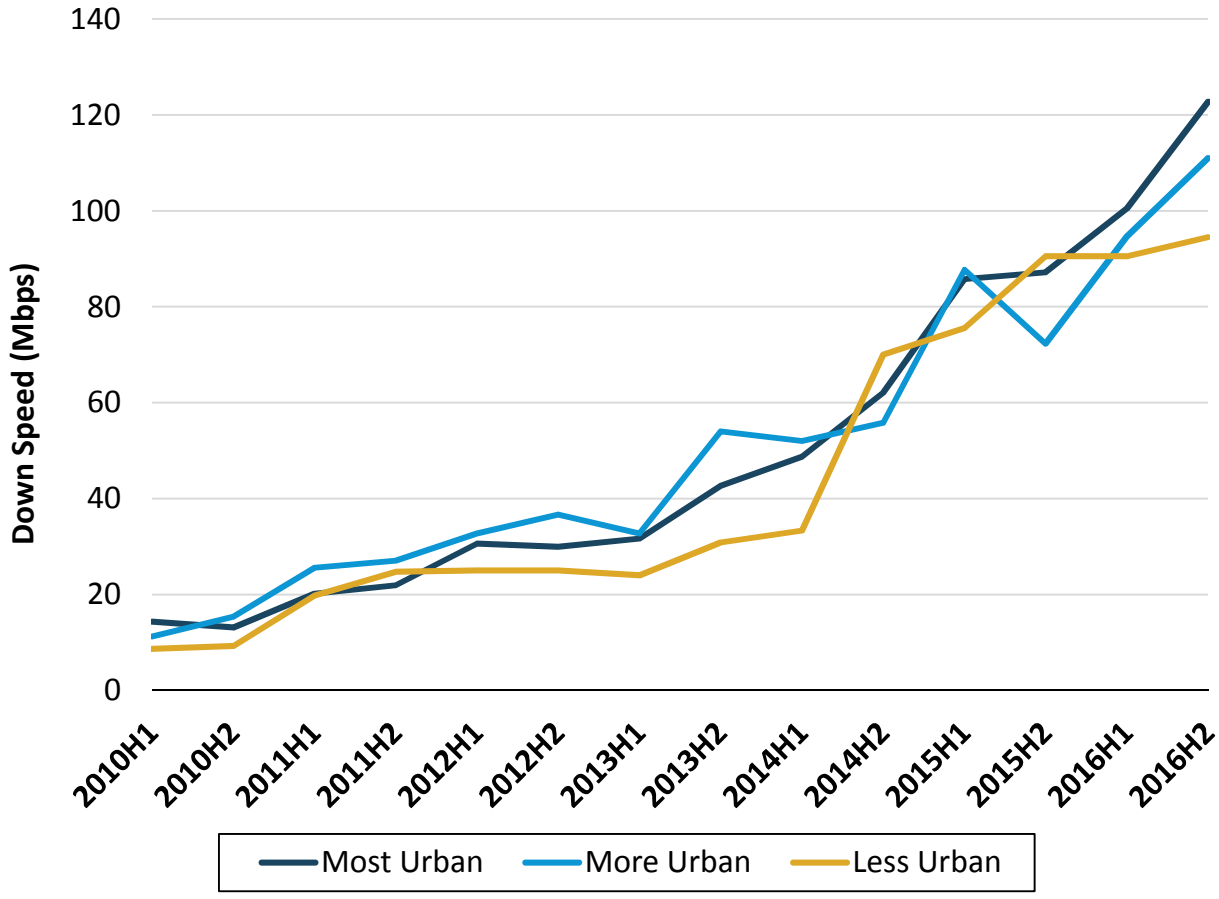


Note: Findings based on FBA's analysis of Kagan & other 3rd-party data

APPENDIX

Purely from a Download Speed perspective, customers across all geographies have had access to consistently higher average speeds

Average Download Speeds by Geography Type [1,2]



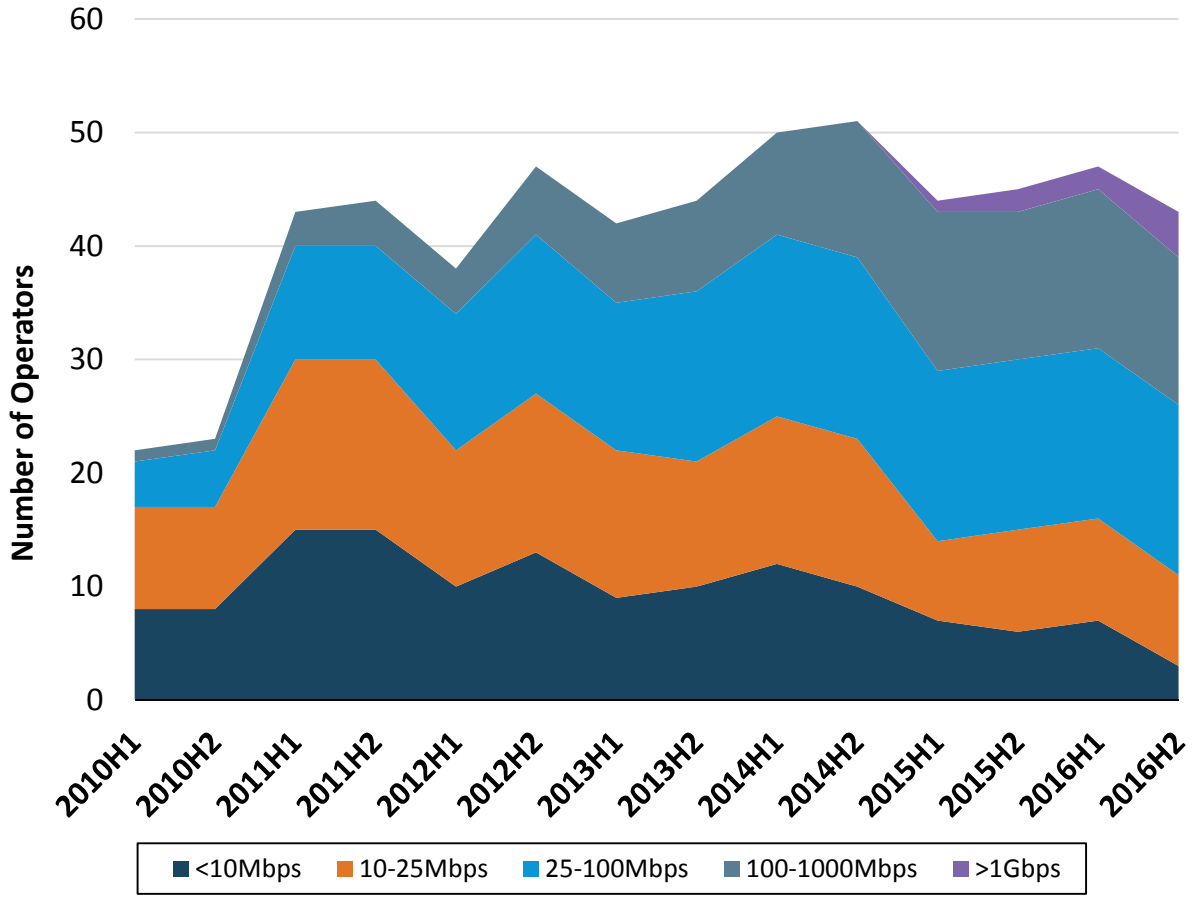
Additional Commentary

- Excludes small number of very high speed packages (>1Gbps) as these disproportionally affect the results
- Shows, for the locations analyzed, that both more and less urban areas have benefitted from availability of higher speed packages

Note: Findings based on FBA's analysis of Kagan & other 3rd-party data

Higher speed tiers have seen an increase in unique operators offering those packages, highlighting a trend in greater competition within the market for these services

Speed Tier Packages by Unique Operator Offerings [1]



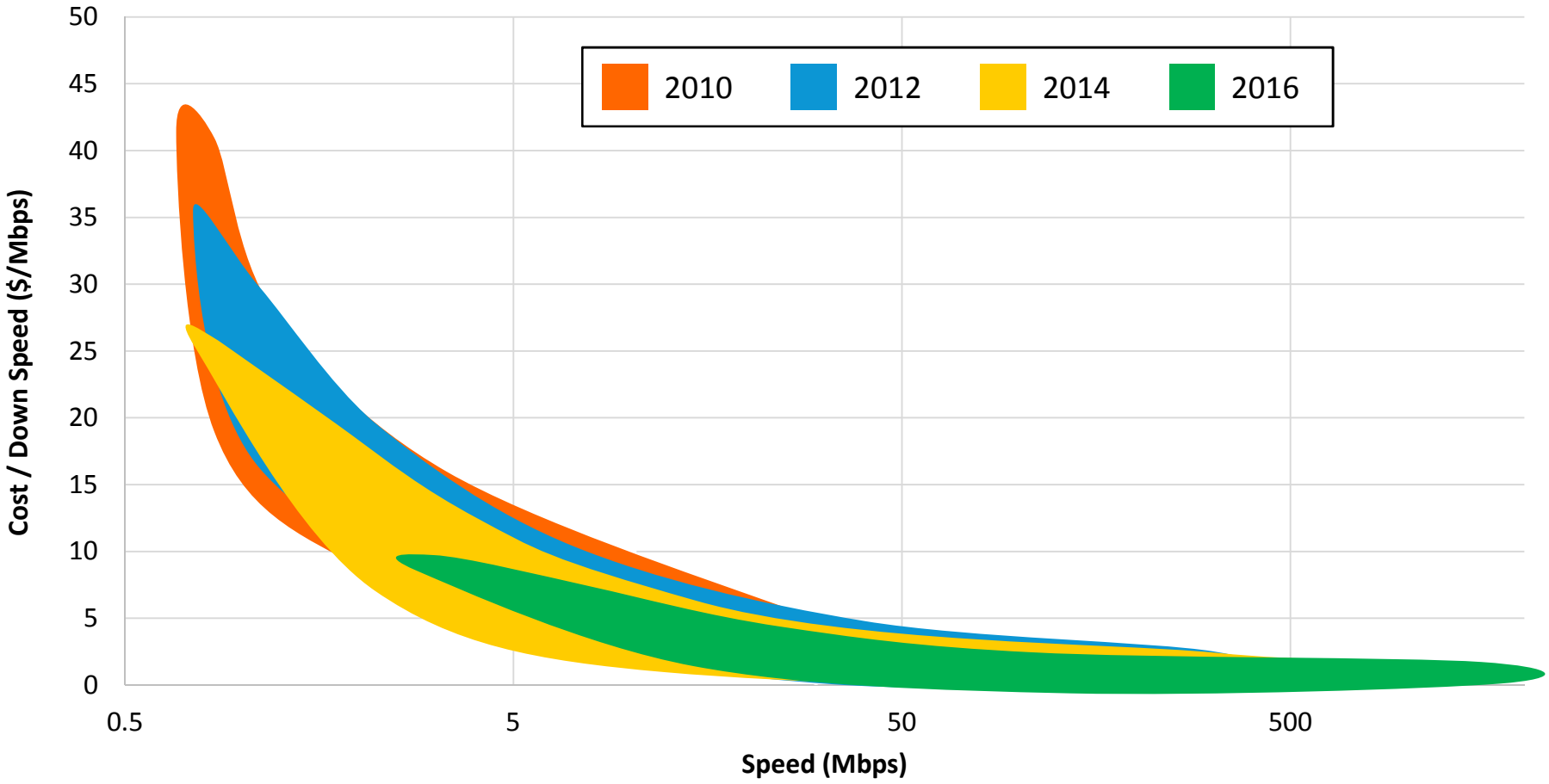
Additional Commentary

- The number of operators offering packages with speeds 100-1000Mbps has increased from 1 (2010H1) to 13 (2016H2)
- Sampling of packages by SNL likely representative of increased market competition for higher speed tiers
- A total of 4 operators sampled were offering packages >1Gbps by 2H2016
- Consumers have an increased choice of higher speed packages from a variety of operators

Note: Findings based on FBA's analysis of Kagan & other 3rd-party data

Reviewing at 2-year intervals, there is a clear trend in both decreasing Cost / Mbps in packages, as well as higher speeds available in the market

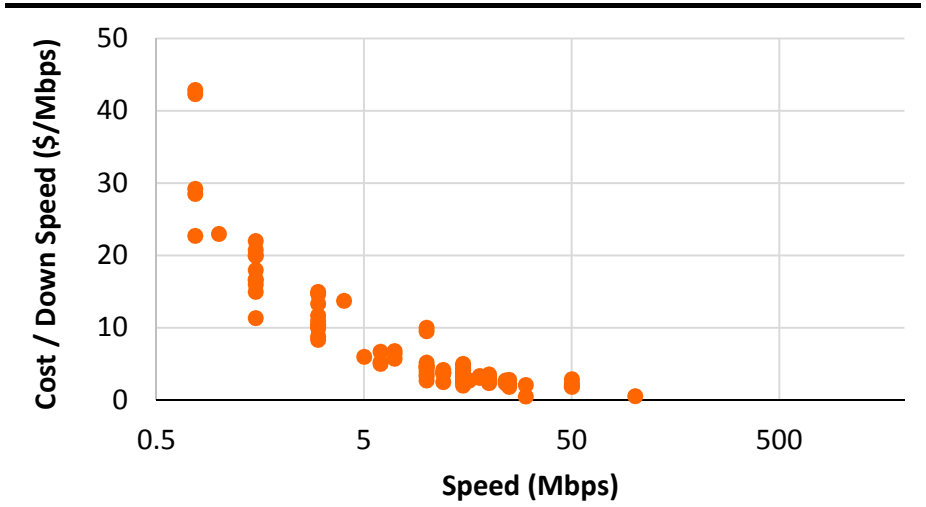
Cost / Mbps vs. Down Speed, Illustrative Package Clusters by Year [1]



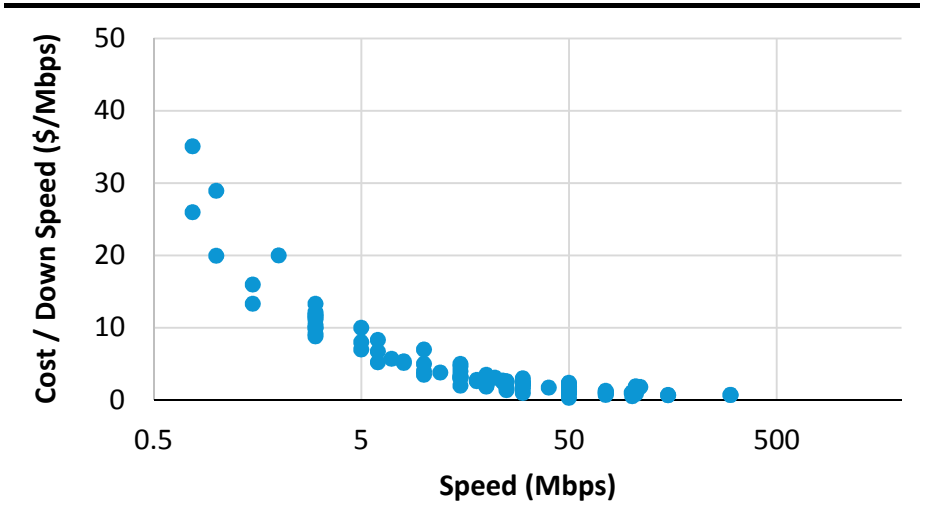
Note: Findings based on FBA's analysis of Kagan & other 3rd-party data

The clear trend of offered packages moving from higher per-Mbps costs and lower speeds towards higher speeds / lower cost-per-Mbps can be observed in detail below

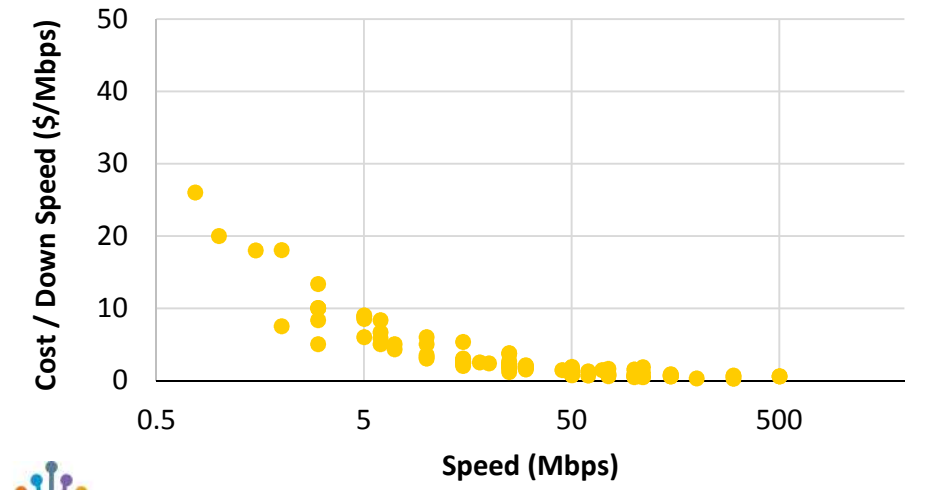
2010H2 [1]



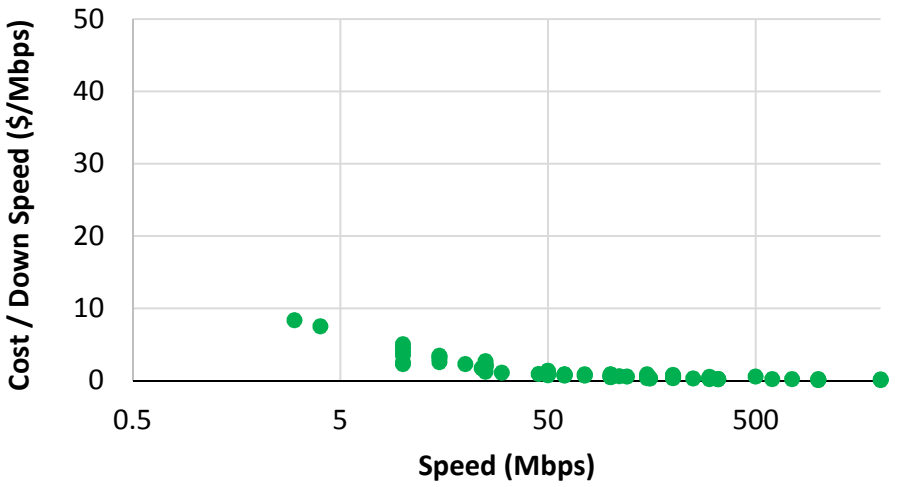
2012H2 [1]



2014H2 [1]



2016H2 [1]



Note: Findings based on FBA's analysis of Kagan & other 3rd-party data